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Area presentation of Sahara Sea after flooding of the Great Desert by the waters of the Mediterranean. Based on plans of French engineers.

CONVERTING THE SAHARA DESERT INTO A SEA.—[See page 114.]

SCIENTIFIC AMERICAN

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

Board of Trade Report on the "Titanic"

TO the readers of the SCIENTIFIC AMERICAN the most interesting portion of Lord Mersey's report on the loss of the "Titanic" will be those sections in which he makes recommendations as to the elements of safety which should be incorporated in the construction of future passenger steamers. From the very first, this journal has held that the most serious feature of the loss of this vessel was the fact that she went to the bottom so soon after the collision; and we have shown that her failure to remain afloat until the rescuing vessels could reach her was due to the omission from the ship of certain protective features in the way of more complete sub-division, which, had they been present, would probably have prevented the loss of a single life.

Lord Mersey attributes the loss of this ship primarily to high speed and an insufficient lookout. He would have been closer to the facts if he had stated that the collision was due to these causes, and the loss of the ship to her insufficient sub-division below the water line. By implication, if not by direct arraignment, the report must be taken as a scathing indictment of the provisions of the Board of Trade; and the public may rest assured that these recommendations following along very much the same lines as those to be found in the report of the Senate's Investigating Committee, will lead to some very thoroughgoing reforms in the Board of Trade. It is naturally gratifying to the SCIENTIFIC AMERICAN to note that the recommendations of a structural character made by Lord Mersey are identical in character and number with those which were suggested by this journal in its first analysis of this disaster, made within a few days of its occurrence.

It is recommended that the Board investigate the practicability of providing sea-going ships, "in addition to their watertight, transverse bulkheads, with a double skin, carried above the water-line, or with a longitudinal vertical watertight bulkhead on each side of the vessel, or with both." The Board is instructed to investigate the question of providing a watertight deck or decks, stretching along the whole or part of the length of the ship at a convenient distance above the water-line, and it is to determine whether the openings should be watertight doors or some other device.

It is further recommended that the sub-division of the vessel should be so adjusted as to "keep the ship afloat with the greatest proportion of her length in communication with the sea." This, of course, refers to the present provision which contemplates only two adjoining compartments being open to the sea. This provision should certainly cover three or even four compartments.

A most important recommendation is that the Board of Trade be empowered to enforce their conclusions on the foregoing points, and to require that the designs of ships should be submitted to it in the early stages of their construction.

We have frequently pointed out that ships which embodied these constructive features would be practically unsinkable—that, at least, they would remain afloat long enough for rescuing vessels to transfer the passengers. To this extent they would serve as their own lifeboats. Nevertheless, in view of the fact that the majority of ships are not built along the lines suggested in this report, we are glad to note that Lord Mersey recommends that the lifeboat accommodations on sea-going vessels be based on the number of persons carried, instead of on the tonnage of the ship, and that they be sufficient for all on board.

Important also is the recommendation that an international conference be called to agree on a common rule for the sub-division of ships, also as to life-saving apparatus, wireless regulations, speed in the ice regions and the use of searchlights.

A Bureau of Farm Power

THAT highly efficient department of the Federal Government which is devoted particularly to the interests of the farmer, contains among its subdivisions a bureau for the investigation of soils, a bureau of chemistry for the analysis of fertilizer, a bureau of plant industry to study the bacteriological problems connected with plant production and plant nutrition, a bureau of entomology to obtain and determinate information regarding injurious insects affecting field crops, fruits, etc., a bureau of biological survey which recommends measures for the preservation of beneficial and the destruction of injurious species of birds and mammals, a bureau of animal industry, for the inspection of animals, meats and meat food products, and the investigation of dangerous diseases among live stock, and a weather bureau which will keep the farmer informed as to meteorological conditions. It would seem that with all these different bureaus the interests of the farmer were well taken care of. However, there is one important branch of farming that has been entirely ignored by the Department of Agriculture, namely, the subject of farm power. The American farmer has outgrown the age of hand labor, and even animal labor is now on the wane. Steam power was introduced on the farm many years ago, and of late the internal combustion engine has been playing a very important part, and now electricity is beginning to be used.

The epoch of mechanical power on the farm has already begun, and it is important that farmers be educated upon matter pertaining to labor-saving machinery. Realizing this need, Mr. H. T. Rainey of New York city introduced a bill in the House of Representatives last month to establish in the Department of Agriculture a Bureau of Farm Power. The province and duties of the bureau are "to investigate and report upon all matters pertaining to methods of furnishing power on farms and all labor-saving machinery adapted for use on farms and the use of electricity, gasoline and steam in propelling farm vehicles in operating plows, reapers, mowing machines, threshing machines and other machines and implements used in planting, cultivating, harvesting and marketing corn, wheat, oats, potatoes, hay, rice, vegetables, and all other agricultural products.

"It shall be within the province of said bureau to make diligent investigations into the matter of machines and labor-saving devices used in the dairying industry as conducted on farms and into the methods of heating and lighting all farm buildings. In general, said bureau is authorized and directed to investigate diligently all machinery, and devices which will lessen the amount of labor necessary in agricultural pursuits and lessen the expense of producing and marketing such of the necessaries of life as are produced on farms and to report the results of said investigations to said Department of Agriculture."

We hope that Congress will see fit to establish this much needed bureau.

A Question of International Good Faith

"ARTICLE 3. The United States adopts as the basis of the neutralization of such ship canal the following rules, substantially as embodied in the Convention of Constantinople, signed the 28th of October, 1888, for the free navigation of the Suez Canal, that is to say: 1. The canal shall be free and open to the vessels of commerce and of war of all nations observing these rules, on terms of entire equality, so that there shall be no discrimination against any such nation, or its citizens or subjects, in respect of the conditions or charges of traffic or otherwise."

The above quotation is from a treaty concluded in 1901 between the United States and Great Britain, known as the "Hay-Pauncefote Treaty," in which, in consideration of certain concessions made by Great Britain the United States agreed, among other things, to operate the canal under similar conditions as regards the ships of all nations making use of the canal.

There is now before Congress a bill which proposes to remit the tolls on ships flying the flag of this country.

It does not take a legally-trained mind to see that such exemption would be a distinct breach of faith on the part of our Government. The question is one of simple, every-day morality. Questions of moral right are universal in their application, and the code of honor is as strict in its obligations on a powerful Government like our own as it is upon the individual citizen. Is it not indeed infinitely more binding? A breach of faith on the part of an individual concerns himself only, whereas a breach of faith on the part of the United States Government reflects upon everyone of the ninety-five millions of people who live beneath its flag?

The peril of the present invitation to a breach of good faith lies in the fact that the issue is being clouded by sophistry. Specious catchwords and misleading phraseology may easily divert the minds of a busy people from the real points at issue in a controversy of this kind. "We built the canal; why should we not make the other people pay for it?" "The United States has invested nearly $400,000,000 in this enterprise; and why should we be called upon to play the part of the philanthropic benefactor, by charging our own ships the same rate of toll as we charge the ships of other nations, who have contributed not a single dollar to the great work?" The answer to all this is, that our Government, after a careful review of the whole situation, and in view of the collateral advantages to be secured in the way of the abrogation of previously existing treaties affecting the Isthmus, and the pledge of Great Britain that the Canadian and the Suez Canals shall be operated on terms of equality, did enter into a solemn agreement to operate the Panama Canal upon terms of equality; and if the United States Government should now violate that treaty by operating the canal upon terms of inequality, it will stand condemned in the eyes of the whole world as having committed an act of international dishonor.

Furthermore, the exemption of United States ships from the payment of tolls would be to divert a portion of the reasonable profits of the canal into the pockets of certain private corporations. We cannot shut our eyes to this fact. The remission of these tolls will not mean the return of any profits of operation back to the National Treasury; and no amount of argument can possibly show that it will. It is urged, of course, that the remission of tolls will serve as a powerful stimulus to the upbuilding of our merchant marine. But we are not by any means prepared to admit that it would. What we do claim, however, is that whatever collateral benefits might be secured, it is impossible to overlook the fact that the gain would be made at the cost of our national reputation for honor and square dealing.

The SCIENTIFIC AMERICAN, as our readers well know, is an earnest advocate of the upbuilding of our shipping industry; but upon mature consideration we feel that this expedient of remitting Panama tolls is not, and in the nature of things, never can be, the legitimate way to achieve this object.

The construction of the Panama Canal must rank as the greatest achievement of a physical character that has ever been undertaken and successfully put through by the United States. We have gained an enviable reputation thereby, and in this particular field our prestige as a great engineering people has been immeasurably increased. It would be a lamentable commencement of the operation of the canal, if we were to cloud this great project by following a course which would bring down the condemnation of the whole civilized world.

"Making" Rain in Battle Creek

ON July 23d Battle Creek, Mich., "put itself on the map" (to quote a local paper) by holding an exhibition of the alleged efficacy of dynamite in producing rain. If the purpose of the exhibition was to attract a large and lucrative influx of visitors for the benefit of the community in general, or to advertise the wares of a local manufacturer who financed the enterprise, or, finally, to promote the sale of explosives, then the citizens of the Michigan town are to be congratulated upon the results of their efforts. Mention should also be made of the moving-picture men, who were present in force to make the most of an unusual event. About 4,500 pounds of dynamite were exploded in the course of the afternoon. A rain area of a hundred thousand square miles, more or less, which had been drifting eastward from the Dakotas since the previous morning reached Battle Creek the day of the explosions; in fact it was drizzling at that place some hours before the firing began, and heavy showers fell all over southern Michigan in the course of the day. In spite of these facts, the rain-makers claim that the particular fraction of the general rain storm that occurred in their vicinity was the result of the explosions. It is entirely superfluous to comment upon this claim, beyond saying that the rain-making hallucination is, apparently, one of the incurable forms of mental disease. Of course any one with a slight knowledge of meteorology, and the current weather map at his disposal, could have "made" rain at Battle Creek on the day in question in the same way in which the traveler in a savage country, having a convenient almanac at hand, "makes" an eclipse of the sun or the moon in order to impress the natives.

Engineering

One-eighth of Canal to be Dug.—On July 1st, the grand total of canal excavation was 173,269,815 cubic yards, leaving to be excavated 22,063,564 cubic yards. This means that more than one-eighth of the entire amount necessary for the completed canal remains to be excavated.

Electric Power from Gatun Lake.—Electric power will be used almost exclusively for operating the Panama canal. The hydro-electric station will be situated adjacent to the north wall of Gatun spillway and the installation will have a capacity of 6,000 kilowatts. The average hydraulic head throughout the year will be about 75 feet. The maximum quantity of water diverted for hydro-electric development will be approximately 7 per cent of the minimum water supply, and will be the excess which is not required for lockages, evaporation, and leakage.

Cuniberti Favors Life Pontoons.—The pontoon method of saving life in the event of the foundering of a ship, as illustrated recently in the SCIENTIFIC AMERICAN, finds an illustrious advocate in Cuniberti, the chief naval architect of the Italian navy. He believes that the upper and after portion of a ship, containing the cabins, etc., should be constructed of wood and form a structure independent of the rest of the ship. This should be bolted to the hull by fastenings which could be readily unlocked in the event of the loss of the ship. Fred T. Jane, who mentions the fact in the *Navy*, suggests that the idea is not any more far-fetched than the idea of building dreadnoughts when it was first suggested by Cuniberti.

Lexington Avenue Subway, New York.—The largest work of subway construction now being carried on in the world is that being done below Lexington Avenue in this city. The line, which will be four-track throughout its entire length, is about 10 miles long. Eight of the 10 miles are now under active construction, and the total cost of the work on this 8 miles alone will be over $35,000,000. Over 3,000 men are engaged on this section. Work is also being prosecuted on the four-mile, four-track subway on Fourth Avenue, Brooklyn, and the Center Street loop subway is being completed. Altogether on the three systems there is now under contract about $61,000,000 worth of work, covering 13½ miles of four-track roads.

A Forty-knot Hydroplane.—England is again about to make an effort to recapture the Harmsworth cup for motor boats, which is now held in America. Four boats have been built, and of these the fastest is the "Maple Leaf IV," a 40-foot boat, with engines of about 500 horse-power. In a contest recently held, the "Maple Leaf," over a 33-knot course, maintained the remarkable speed of over 40.03 knots or about 46 miles an hour. Considering the length of the course this is certainly an extraordinary speed; and in view of the fact that several boats have been built in this country which are credited with equally high speed (that is to say, if the newspaper reports are correct), we may look for an excellent contest this summer on Long Island Sound.

Reduce Railway Speed.—The Public Service Commission found that the breaking of the rail which caused the wreck of the Twentieth Century Limited was largely due to the high speed of the train, and it referred to the schedules as being "too fast for safety." On the other hand, we notice that recently the engineers of the Union Pacific Railroad stated that the breaking of rails could be prevented by putting more metal into the base. Both points of view are correct; but we are inclined to agree with the Public Service Commission that, as matters now stand, and in view of the heavy wheel loads, the rail is not equal to its task. If rails were heavy, and if the specifications were stricter and the process of manufacture were carried out with greater care, railroads could run their trains as fast and even faster than they do to-day, with impunity. It is quite possible to manufacture rails which will stand up under any traffic whatsoever; but it is certain that the average rail used to-day on American railroads is not equal to its duties.

Double-deck Cars for New York.—It is reported that the Interborough Company is studying the question of the introduction of double-deck cars in New York city. This is the right idea; indeed, the SCIENTIFIC AMERICAN, many years ago, had a series of articles strongly advocating the use of this type. The introduction of an upper deck practically doubles the capacity of the car, without involving any proportionate increase in the weight or in the power necessary to drive it. The number of passengers per unit of length is doubled, and when the public get accustomed to this type, we believe that there will be very little increased delay at the stopping places, due to the larger number of people boarding or leaving the cars. The low car which is running experimentally in New York would be well adapted for double decking, as the total height of such a car with another deck would not be so great as to interfere with the overhead structures, at least on many of the crossings in the city.

Science

Mt. McKinley.—A telegram has been received from Mrs. George Brown, mother of Belmore Brown, the companion of Prof. Herschell Parker on his third attempt to ascend Mt. McKinley. The telegram states that a height of twenty thousand feet was reached, which means that the summit is still unconquered.

Plans of Capt. Amundsen.—The discoverer of the South Pole expects to return to Europe in September and will make a series of addresses before the principal geographical societies, beginning with the Norwegian Geographical Society in Christiania. He is to address the Royal Geographical Society in London on November 18th. The Norwegian Storthing (parliament) has voted him a grant of 136,365 kroner (about $36,818) toward his prospective north polar expedition.

The Cost of Discovering America.—The English newspapers print a report from Madrid to the effect that some ledgers discovered at Palos, Spain, contain interesting information on the cost of discovering America by Columbus. The sum total for which America was discovered amounted to $7,000, or 38,000 pesetas. This was distributed as follows: 14,000 pesetas for armament; 2,000 pesetas for personal expenses of Columbus and his officers and crew; 22,000 for general expenses during the eight months for which the voyage lasted. The sum of $7,000 in 1492 represented $70,000 in 1912.

Mikkelsen Heard From.—A most amazing tale of hardship endured in the polar regions is that of Capt. Mikkelsen published in the New York *Times*. He suffered from the very beginning. Abysses, storms, lack of food, scurvy, all imaginable obstacles to polar exploration he encountered. Only the briefest details have been received outside of the news of the safe return of the men. Capt. Mikkelsen and his companions reached Denmark Firth on May 20th, 1910. There they found the records left by Erichsen. They began their return journey nine days later and encountered terrible hardships. They reached Shannon Island. They had abandoned all hope of their rescue when they were picked up by a Norwegian fishing vessel on July 17th last and brought back to Aalsund.

The Alaskan Reindeer Herds.—During the ten years, 1892-1902, the U. S. Bureau of Education introduced 1,280 European reindeer into Alaska, where the natives were threatened with starvation owing to the destruction of the once abundant American reindeer, or caribou. It was also expected that these animals would serve the many useful purposes in the domestic economy of the Alaskans for which they have been so highly prized in northern Europe and Asia. The success of the undertaking has been remarkable. A recent official report on the subject states that these herds, which are under the care of the teachers at the government schools, now number 33,629 head, and they are increasing rapidly. Their meat is in great demand by both whites and natives, and their skins supply the best winter clothing. It is expected that the exportation of reindeer meat will soon become an important industry. Above all, the reindeer has proved a most efficient civilizing agency. The success of the Alaskan reindeer enterprise induced Dr. Wilfred Grenfell, in 1908, to import 300 reindeer from Lapland into Labrador, where they have now increased to about 1,200, and are a great boon to the natives. Last year the Canadian government bought 50 of Dr. Grenfell's herd for introduction into northern Canada.

Observation of Solar and Lunar Halos in France.—The most complete descriptive account of all known forms of solar and lunar halos is that published last year by Louis Besson in *L'Astronomie*, the organ of the Astronomical Society of France. The principal purpose of M. Besson's memoir was to call attention to the urgent need of accurate and systematic observations of these interesting phenomena, many of which have so rarely been seen and described by trained observers that the data needed for their theoretical discussion are decidedly fragmentary at present. This suggestion has met with a hearty response on the part of French meteorologists and astronomers, and every number of *L'Astronomie* now contains reports and descriptions of halos; often accompanied by drawings, and sometimes by photographs. Several rare forms have already been reported. In only one other country, viz., Holland, is there a large and active corps of halo observers. Their observations have been published annually by the Meteorological Institute of the Netherlands and have greatly enriched the branch of science dealing with this generally neglected subject. The history of halo-observing the world over has been remarkable in the fact that in the days of our grandfathers these phenomena were much more generally watched for and more widely known to scientific men than they are to-day. A revival in the study of halos is an urgent desideratum, especially in English-speaking countries. As halos are especially common in the polar regions it is desirable that polar explorers should acquaint themselves with the detailed literature of the subject (all of which is in French and German) before they embark upon their travels.

Aeronautics

The Military Breguet Biplane.—The new military biplane designed by Breguet is a remarkable machine in every way. The power plant is mounted in front as in most monoplanes. A 14-cylinder 100 horse-power Gnome engine drives two two-bladed propellers through reducing gear. Only four very stout vertical struts are employed between the planes. The body is of torpedo shape and is constructed of steel tubing, steel girders and ash. Wood plays but very little part in the construction of the machine. The machine can be completely folded in five minutes.

The National Balloon Contest.—On July 28th seven balloons rose from Kansas City, Mo., in the National Elimination Race. The winner was the balloon "Uncle Sam," piloted by Capt. H. D. Honeywell, Roy F. Donaldson, aid, entered by the Kansas City Aero Club. The distance covered was about 925 miles, the balloon landing on the historic battle ground of Bull Run. The second in the race was the "Kansas City II," piloted by John Watts, George Quisenberry, aid, entered by the Indianapolis Aero Club. The distance covered was about 640 miles. The third in the race was the balloon "Drifter," piloted by Albert Holtz, Charles Trautman, aid, entered by the Cincinnati Aero Club. The distance covered was about 425 miles.

Requirements for Naval Aeroplanes.—On the 25th ult. specifications for hydro-aeroplanes, with which, by another year, it is hoped to have every battleship equipped, were issued. Constructors are requested to inform the Navy Department by August 15th if they intend building machines to fulfill the requirements, and to state when such machines will be ready. They are required to carry, as a full load, two persons of a combined weight of 350 pounds, together with a wireless outfit and other instruments and supplies for a 4-hour flight. A maximum speed of 55 miles per hour must be shown as an average of ten flights—five with the wind and five against it—over a mile course, and 50 miles per hour throughout the 4-hour endurance test with full load. The latter test will be made over a 5-mile triangular course, the speed being determined by a recording anemometer. All machines must rise from the water in still air, with a run of not over 1,000 feet; must climb to 1,500 feet in one or more big spirals and in a given time (not yet determined) must turn without skidding, stalling or sliding, in a circle of 200 yards radius, and must glide from a height of 500 feet with power off a distance of 2,500 feet in a horizontal direction. Air-cooled motors are preferred and an extra premium will probably be offered for a heavy-oil motor or one using kerosene or alcohol. It must be arranged to be started from the seat by the pilot. The machines must be able to be hoisted on board ship intact and to be quickly disassembled. The hydroplane floats must have watertight compartments and means of draining readily. The aeroplane must be able to remain upright on the surface of the sea in a 20-mile wind when the motor is stopped.

A Woman's Opinion of Aviation.—Mrs. Elizabeth Hiatt Gregory, a woman writer who specializes on aeronautics, gave a lecture before the Aeronautical Society of New York on "Woman's Part in Aviation." It was the opinion of Mrs. Gregory that flying is an unsuitable occupation for women, and under no circumstances should she be allowed to use an aeroplane, since its safety is mostly a matter of gamble. Instead of relying upon an instrument, the aviator trusts principally to his own watchfulness, which obviously leaves the margin of danger very great, as there are many accidents due to uncontrollable error on the part of the machine or tricks of the wind. Mrs. Gregory stated that aviators put too much stress on their ability to ward off accidents by this watchfulness. As an example she referred to the late Miss Harriet Quimby, whose very first accident resulted in her death. "A few days before her death," said Mrs. Gregory, "Miss Quimby told me that driving an aeroplane was as safe as riding in an automobile, as long as one was careful. She had tried both. She thought mishaps with few exceptions came to those who attempted foolhardy feats. She claimed that in driving an automobile the driver has sudden starts and stops, twists and turns through the crowded thoroughfares; while the air-pilot must constantly be on the lookout for cross-currents and pockets that may upset his craft." Miss Quimby thought women were as well fitted for handling an aeroplane as men. It was merely a matter of personality, she maintained. The lecture was illustrated with lantern slides, showing both the American and foreign women of the air. Pictures of men fliers in spectacular feats were also thrown on the screen. Mrs. Gregory said that while only twelve women in the world have been granted pilots' licenses, there have been five deaths. Three of these have been American women. The first was Miss Denise Moore, an American girl, who while completing her tests for a license at the Farman School in Paris, had her fatal fall. The other two were Miss Harriet Quimby and Mrs. Julia Clark. Both Miss Quimby and Mrs. Clark had made their qualifying tests.

The Cream Separator

Its Development, Advantages and Unsolved Problems

The parts of a revolving bowl: fastening nut, shell, liner and feed tube.

FIFTEEN years ago the creameries of this country still followed the custom of maintaining cream routes, from which the hand-skimmed cream was collected from three to six times a week. A few years later these routes were a thing of the past. Instead, separator stations were maintained at centrally located points, to which the farmer could bring his milk, have it separated in a few minutes, and return with his skim milk and receipt for his cream. But now another change has come over the industry, and instead of taking his milk to one of the numerous separator stations, each farmer separates his milk on his own farm and in his own separator, and once or twice a week, when he goes to town to deliver eggs and to buy provisions, he takes along the cream. The one great factor in these revolutionary changes in a great industry is the centrifugal separator, and it is the purpose here to trace very briefly the growth and development of the separator, to point out its advantages, and to discuss some of the problems still unsolved.

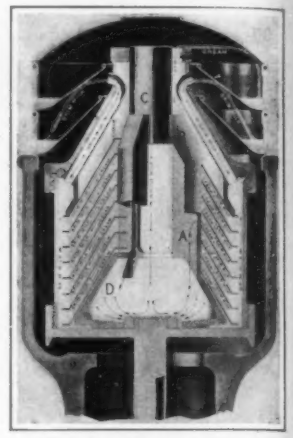
Your milk, homogeneous when bottled at the dairy, will be found in two fairly well defined layers when you bring it in from the doorstep early in the morning. A few hours later, the line of separation will be found at a lower level. The separation is due not to one cause, but to several; but the most important single cause, and the one which determines the relative positions of th layers, is the fact that the particles of the lower watery layer are heavier, or rather have greater mass, than the particles of the upper or oily layer. The older methods of separation all depended on the force of gravity acting to separate the two component parts of the milk, and all improvements were directed to modifying other conditions. It is a well known fact that the relative viscosity of the two constituents influences the rapidity of separation, and the relative viscosity can readily be modified through certain changes in temperature. Both the shallow pan method and the deep can method depended for their efficiency on a favorable adjustment of viscosities. The water dilution method was only another step in the same direction, but although all of these methods were in use for many centuries, no appreciable advance was made in the industry.

The mass of a body cannot be changed. Its weight, or apparent mass, can however be changed by putting the body in motion. A very simple experiment will prove this. If a rapidly descending elevator comes to an abrupt stop, the sensations of the passenger will be convincing. A small weight on a spring balance suspended in the elevator would give the exact measure of this apparent increase in mass. The spring balance may also be used in another way to demonstrate the same truth. Secure a weight to the balance, and swing it at arm's length as you would a sling. While in motion, the pointer indicates a greater mass than when at rest. The mass remains the same, but apparently it increases, and in this case, the force which produces this result is known as centrifugal force. This force is similar in effect to that of the force of gravity, but within wide limits it can be increased at will.

A liquid composed of two liquids of different densities, as an emulsion of oil and water, remains stable only by virtue of the attraction of the particles for one another, which varies with the different liquids. In the case of oil and water, this attraction is very small, and to break up such an emulsion it is necessary only to apply a force which will overcome the attraction between the particles of oil and the particles of water. Gravity alone will do it by acting more powerfully on the water than on the oil. If the force of gravity would be multiplied say by ten, then the weights would be multiplied by ten and the difference between the weights would be correspondingly increased. This would mean that while the force which tends to hold the particles together remains the same, the force which tends to pull them apart is increased ten fold. The result would be a more rapid and a more thorough separation. The force of gravity, however, cannot be increased, but in the centrifugal machine we have a force which will accomplish the same result.

Throughout its development, the history of the cream separator is inextricably bound up with progress in a number of other arts. The high speeds necessary for efficiency were made possible only by many improvements in journal boxes and frictionless bearings. Then, too, the development of the separator had to wait on the development of steel—an extremely hard steel for the bearings and an extremely tough steel for the bowl. It must be remembered that the pressure generated within that thin wall of steel is as great if not greater than the pressure in a locomotive boiler. But we shall confine ourselves here to the development of the centrifugal machine for separating out the cream from milk.

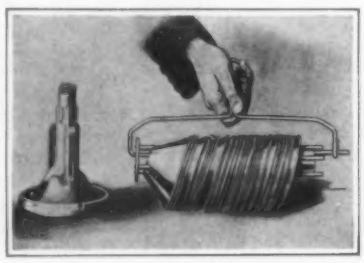
The first application was made about 1860, in Germany, with a glass tube swung rapidly about a center, to determine the richness of milk samples. The modern Babcock tester is identical in principle. It consists of a vertical spindle with radial horizontal arms on which graduated glass tubes containing milk samples are suspended. By rotating the spindle through its gearing, the tubes assume a horizontal position. The first attempts at separating cream from milk in larger quantities were made with a similar apparatus, pails being used instead of glass tubes. Then followed the single closed pail, centered in an upright position on a vertical spindle. The rapid rotation caused the milk to assume the form of a wall at the periphery of the pail, and when the machine was stopped, the two layers which had been vertical became horizontal, with the cream on top. All of these devices necessitated hand skimming after separation of the milk into layers. Such was the state of the art after twenty years of development, when in 1880 Houston and Thompson obtained a patent on a self-skimming separator which was continuous in operation. This machine was faulty in practice, but it marked an epoch in cream separator history because it pointed the way to other inventors, who quickly solved the mechanical problems involved in the working out of a successful separator of this type.



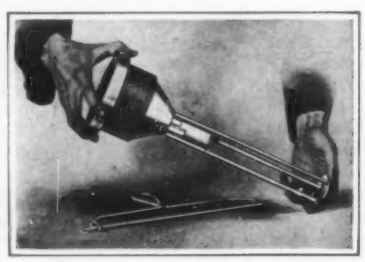
Sectional view, showing course of the milk entering a bowl and the paths of the skim milk and cream during and after separation.

The next great step was the invention of the liner, patented by Baron von Bechtolsheim in 1890. This consists of a number of division contrivances in the bowl, dividing the milk into thin layers, and intersecting the radial path of the milk in its passage toward the periphery. Separators up to that time had all been of the hollow bowl type. In nearly all, the milk was fed in through a central tube to the bottom of the bowl and the skimming was done at or near the top. The milk thus was caused to flow outwardly from the center and upwardly along the wall. The liner, however, broke up the milk into thin layers while under the influence of centrifugal force, and thus avoided the eddy currents which would tend to form in a hollow bowl. Before von Bechtolsheim's invention various division contrivances were already in use, but none of these were based on the liner principle. Baffle plates were well known. Their function was merely to compel the body of milk to partake of the motion of the bowl, since its inertia would otherwise cause it to travel at a slower speed. Thin horizontal plates, to obstruct the milk in its upward path, had also been in use. Dr. Gustaf de Laval.

(*Continued on page 124.*)

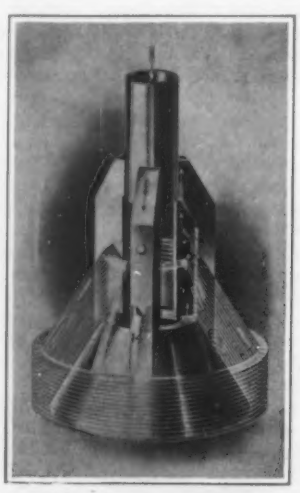


Tool for holding together the disks of a liner while washing them. By the use of the tool the disks may be washed as a single piece.



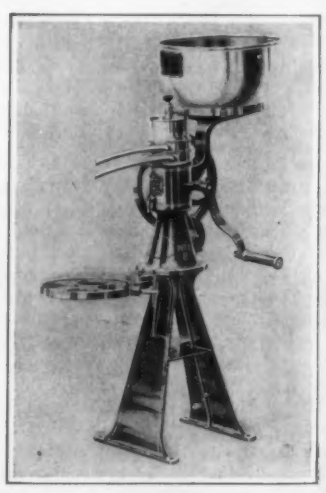
Method of transferring the disks of the skimming device upon the tool preparatory to washing or of replacing the disks on the liner.

View in phantom of a de Laval disk liner structure in position on the spindle. The whole milk is fed through the hollow spindle *T* and emerges between the disks, through the openings in the wings *W*.



View in phantom of another liner. Course of milk in the bowl. White pointed arrows indicate whole milk; all white arrows show cream; black pointed arrows partially separated milk.

A general view of a separator with part of the machine shown in section in order to reveal the very simple gearing, the system of lubricating and the inner construction of the center balanced wheel.



A view showing a complete hand separator having a capacity of four hundred and twenty-five pounds of milk per hour. The machine measures forty-six and a half inches in height to the top of the can.

The International Motor Contest at Winnipeg

An Annual Traction Engine Contest that Means Much to Farmers and Manufacturers

By L. W. Ellis

THE great annual Motor Contest at Winnipeg is over and the addition of four great tables of definite information to that already brought out on the farm tractor, is a notable event in the technical world. Competition this year was keener, if anything, than ever before, and although some of the contestants in earlier meetings dropped out, the newer ones who took their places showed that they were rapidly overtaking the former leaders in efficiency.

The Winnipeg Motor Contest can hardly be said to have that diversity of interest that marks the contests in France, because under the conditions named there is little encouragement for the appearance of such a variety of types as were seen at Chelles last March. The American farm tractor has become practically standard in so far as the method of attaching the plows or cultivating instruments is concerned. The direct traction method prevails, and all of the tractors seen in the contest at Winnipeg were those having separate plows attached by chains to a drawbar at the rear of the engine.

This does not mean that the Winnipeg Competition has not brought out new types of machinery. Indeed, it is the one big event of the year, where the fond inventor or builder proudly brings forth his creation to find out how it compares with those of established reputation. Sometimes the new comers give a remarkably good account of themselves, and frequently all "dope" is upset by truly remarkable performances of some new machine. Last year the four-cylinder Aultman-Taylor gasoline tractor, which many, even of the technical visitors, saw for the first time at the Contest, gave the gold medal winner a close run, and this year two tractors of the same general type won, respectively, a gold medal in the class for larger gasoline engines, and a silver medal in the class for larger kerosene engines. The J. I. Case Threshing Machine Company appeared on the market this year for the first time with a gasoline tractor in addition to their regular steam engine line and with the smaller type won a gold medal in competition with several makes which have been represented in previous competitions.

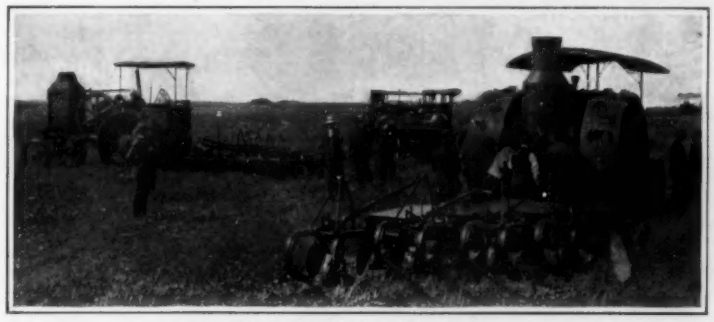
The Holt-Caterpillar, a machine very similar in appearance to the Lefebre tractor pictured in the SCIENTIFIC AMERICAN SUPPLEMENT, June 29th, made a notable record in plowing after a less fortunate brake test. It demonstrated the efficiency of the peculiar type of traction wheel and would have received a silver medal in the larger gasoline class but for a penalty of 29 points for failure to be ready on the brake test—a failure due to the shortcoming of an expert who was intrusted with the preliminary work of getting ready for the Contest.

A four-wheel-drive tractor, made by Heer Engine Company, demonstrated great tractive efficiency in various ways, but unfortunately met with an accident to one of its drive chains while assisting a competitor out of a mud hole in the prairie, and was somewhat handicapped in the Contest. The American Gas Tractor was also a new comer and showed up very nicely as to construction and power, although scored quite low for a high fuel consumption, which should disappear with further refinement.

Among the older competitors the J. I. Case Company had things practically its own way in the steam engine classes, having the only engine in each of the two smaller classes and a comparatively easy victory over the Sawyer-Massey Company in the class for the largest engines. The latter company was unfortunate enough to meet with a minor accident shortly after the start in the plowing test, and it was necessary to draw fires until a new blow-off cock could be put in place. The Case Company was awarded the gold medal and two diplomas.

A Case steamer taking water on the run.

I. H. C. Mogul 45, pulling eight plows in class B, and winning a bronze medal.



The line-up before the start.

The American gas tractor in the foreground; the Rumely 15 horse-power oil tractor at the left; and the International Mogul in the distance.

Driving a bee-line with a 15 horse-power Rumely tractor.

The J. I. Case gold medal winner in class B. Drawing five plows.

None of the other large steam engine concerns such as Reeves, Avery, Rumely, Nichols & Shepard, or The Russell & Co., entered the steam engine classes, although competing strongly in the market. There is a tendency to belittle the steam engine trade of the present because of the overshadowing number of internal-combustion tractors brought forth in these competitions. However, steam tractor firms are all apparently building as many engines as before, and some have greatly increased their business, even in the face of the strong gas tractor competition of the last few years.

The International Harvester Company, the Avery Company and M. Rumely Company have been consistent performers in these competitions for a number of years. This year the International engines won a gold medal in the smaller kerosene class and a silver medal in the smaller kerosene class; a silver medal in the larger gasoline class, and a bronze medal in the larger kerosene class, having had five entries in competition. The tractor, made by M. Rumely Company, won easily in the larger kerosene class and scored the highest number of points given to any tractor in the entire contest. The smaller Rumely tractor, with a motor somewhat different in design from the standard type, secured a silver medal in its class, though scored low on fuel consumption. The Avery Company secured two bronze medals, one on kerosene and one on gasoline, using the same type of engine in both cases.

Canada was not well represented in the contest although Goold, Shapley & Muir, of Brantford, won the silver medal in the smaller gasoline engine class, and Sawyer-Massey received a silver medal in the steam engine class. The greatest competition came in the class for the larger sizes of gasoline engines, and the number of large engines in the contest indicates that there is no likelihood of their being discontinued at an early date in favor of smaller tractors.

The entire motor competition was carried out in practically the manner described in the SCIENTIFIC AMERICAN, June 29th. The exhibition officials had provided this year a new testing shed, with two new friction brakes securely anchored to beds of concrete. With this and other new equipment, the brake tests were run off without delay. The two-hour economy tests showed a vast improvement in the fuel efficiency of the leading engines. Little criticism can be made regarding the handling of the economy brake tests, as all apparatus were so arranged that spectators could keep close check on all readings as to fuel and load, and there was little possibility of error.

A half-hour maximum test was given each engine, the idea being to ascertain the highest amount of power that could be turned out continuously without causing the engine to show distress. Points were given on the steadiness of running, the condition of the engine, and for the excess of horse-power developed in the maximum test over what was developed in the

(Continued on page 124.)

A Plan for Converting the Sahara Desert Into a Sea

What Would Happen if the French Flooded the Great Desert

By G. A. Thompson

A SENSATION was recently caused in Paris by the daring proposal of Prof. Etchegoyen, a distinguished scientist, who declares that France ought to lose no time in converting the vast desert of Sahara into an inland sea. He claims that, since "about a quarter of the whole desert area lies below sea level, the construction of a canal some fifty miles long through the higher land of the north African coast would immediately create a Sahara Sea equal in size to about half the extent of the Mediterranean." This canal, he states, would present no great mechanical difficulties because the coast land is composed of sand and soft rock formations.

The consequences of such engineering, he declares, would be gigantic. All the arid regions now surrounding the desert and those parts of the Sahara which are above the level of the ocean would be rendered as fertile as Europe, since the present sterile condition is due to no fault of the soil but is caused solely by lack of water. Millions of human beings could then support themselves in comfort, who now lead a miserable existence on the verge of starvation. Moreover, a great new colony could be added to the possessions of France, of which the political and economic importance can hardly be overestimated. A fleet of steamers would navigate the Sea of Sahara, the depth of which would vary from ten to sixty fathoms, and produce a flourishing traffic between Algeria and French West Africa. And the most remarkable result of all would be the alteration of the climate of all northern Africa from equatorial extremes of heat to the pleasing temperature of Natal, thus enhancing its value as a place of colonization for Europeans.

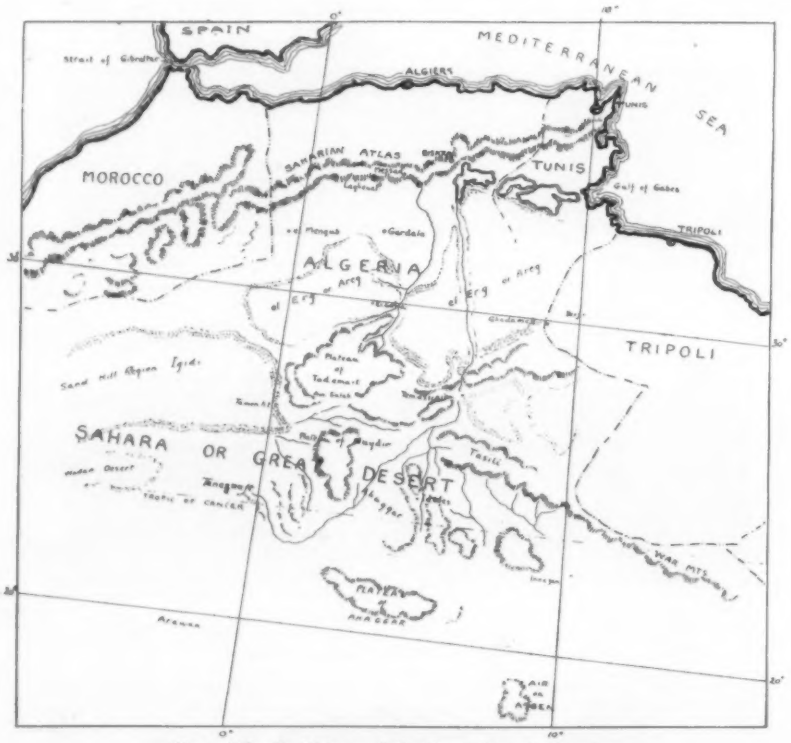
Prof. Etchegoyen's scheme is provoking much comment, and objections are not wanting. Certain meteorological experts cry out in horror that any tampering with weather conditions in Africa would transform the climate of Europe; that, if tropical Africa should become temperate, Europe would become arctic, and an alarming picture is drawn of England, Belgium, and Denmark lying under several feet of perpetual snow, and their inhabitants either emigrating in haste to milder countries or leading thenceforth the lives of Eskimos. A still more striking reason for leaving the great desert alone is presented in the argument that, by the displacement of so many billions of tons of water, the equilibrium of the earth would actually be affected, and that the engineer who had undertaken the task of adding a new sea to the map of the world would forever afterward be cursed by humanity for having altered the axis of the globe.

On the other hand, various savants consider that these objections are illusory; that the possibilities prophesied are much exaggerated. These men are rejoicing in "another magnificent idea originated in that country which conceived the Suez and Panama canals." The time is near at hand, they claim with enthusiasm, when "the parched ground shall become a pool" and "the desert shall blossom as the rose," as foretold by the Hebrew seer centuries ago.

Considering the broad interest and influence to be established by the undertaking of such a scheme, and the remarkable confliction of opinion concerning its effect, some popular statement of Saharan conditions is apropos at this time. The frigid zones and the "Highlands of the World" have occupied so much of the public attention during the past few years that only the vaguest thought has wandered toward this "last of the unexplored places." As a matter of fact, however, there is no more interesting region on the earth than the great desert of Africa, nor one about which so little is generally known, nor concerning which so many fascinating myths are told and believed. Since the earliest records of history it has been a place of sublime mystery, of dread and weird terrors, of strange and impossible happenings. From the pyramids all the way across the continent to the Atlantic Ocean it reaches—and what is it like, what fearful secrets does it hide? In reality, the Sahara is not so fearful as it is grand and wonderful, as the ocean is wonderful, or any other expression of nature on a gigantic scale, and like the ocean it can be tamed to the service of mankind if approached in proper fashion.

Notwithstanding the fact that the desert has been traversed from time immemorial by native tribes carrying fruits and silks and costly woods and ivory for barter from center to coast settlements, and still is crossed at certain points by important caravan routes, it is even to-day almost entirely unexplored by civilized men. Sir Lambert Playfair, Dr. Erwin von Bary, De Lenz and a few others have partially explored certain portions of it during the past twenty-nine years, yet there still remain large tracts of the territory that have never been viewed by the eyes of any white man.

Topographically, almost the whole northern half of Africa is a desert, in which Egypt and fertile mountainous tracts along the Mediterranean may be regarded as large oases. Geographically, there are three deserts—the Nubian, bordering the Red Sea and reappearing across the sea in Asia in the Arabian Desert, the Libyan, between Fezzan and Egypt, and Sahara or the Great Desert, which includes a number of small arid tracts that extend like long arms far into the fertile regions north and south of its principal body. The last presents a vast undivided waste almost two thousand miles in length from east to west, and nearly one thousand in average breadth from north to south. This means an approximate area of 3,595,500 square miles, one equal to the whole of Europe, without the Scandinavian peninsula. Politically, the Sahara belongs to the various countries which border it or which exercise a protectorate over lands that lie near. Hence, Morocco, the Turkish Empire, Italy, and, through Algeria and Tunis, France, own each its neighboring portion; but by far the chief part of the territory belongs to France along with the French Kongo and the colony on the Senegal.



Map of North Africa and the Great Desert, showing the topography that would shape the Sahara Sea.

The Sahara Desert has several very curious features. The most remarkable is, perhaps, its distinctness of boundary. Standing on the southern slope of the Atlas range, one looks out upon what has almost the appearance of a boundless sea, which forms, as it were, a bold coastline along its northern edge, whose sheltered bays and commanding promontories are occupied by a series of towns and villages. Toward the south, as in Morocco and Algeria, the desert comes to a close in some localities as suddenly as if it had been cut off with a knife, in others it merges gradually into the well-watered and fertile lands of the Soudan. This sea-like aspect of certain portions of the Sahara has given rise to much popular misconception as to its general appearance, and has even affected the ideas and phraseology of some scientific writers. It is not at all the low sand-plain that it is widely supposed to be. It is rather a region of the most varied surface and irregular relief. Rugged hills of barren rocky formation, known as *hammada*, plateaus of firm clay, mighty fields of loose stones and water-worn pebbles, shallow basins filled with very salt water, and arid steppes covered with sage brush are interspersed with the famous sand-dunes which give character to this remarkable region. Those terrible expanses of shifting sand so fine that it actually penetrates the skin of the traveler and makes breathing distressful lie chiefly toward the east, in the Eastern Erg, as it is called. In the Libyan Desert there are such expanses of vast and unknown limit. In the Western Erg from the Atlantic coast to south of Cape Blanco a broad belt of dunes called Igidi or Gidi—from the Berber word for *dunes*—extends thirteen hundred miles northeast with a breadth of from fifty to three hundred miles.

This is the region which from the highlands of Algeria and Morocco looks so much like a storm-tossed sea. The dunes in all parts of the Sahara lie generally in long undulating lines, very like the billows of the ocean, with gradual slopes to windward and an abrupt descent leeward. They are usually sixty to seventy feet in height, but are said to attain in some places fully three hundred feet. The sand that forms them is exceedingly fine, being, in fact, the dust of rock battered and powdered by the action of centuries of fierce winds and rainless heat by day and sharp chill by night. In this condition every slightest breeze is sufficient to raise it in choking clouds, though the amazing reports of frightful sand-storms which overwhelm whole caravans being the common thing in the desert are mere fairy tales. Under the influence of the winds, all the dunes are subject to a certain amount of continual change, of course, but their equilibrium is such that in topographic distribution they are comparatively permanent. Some of them even have names of their own, like the Gern (peak) al-Shief and Gern Abd-al-Kader to the south of Golea in Algeria.

The color of the sand dunes *en masse* is a rich golden hue, which glints and gleams in the glare of the sunlight with a dazzling strength. Each individual grain is reddish-yellow from the presence of iron, and generally crystalline from having once formed a part of soft quartz rock. Gneiss and mica schists, granite, limestone, slates and basalt all appear in the rocky formation of the Sahara, but the relative proportion of their distribution is not yet fully known. In the central part of the desert south of Algeria there are large extents of red sandstone formations, whose dust carried seaward by the winds is said to produce the peculiar red sky effects noticed sometimes over certain parts of the Atlantic, and notably over Algeria, whither artists journey from every quarter of the earth to study and copy the marvelous combination of rich crimsons and purples and amber. Such sand—produced by the fracturing and crumbling of the cliffs through alternate daily heat and rapid radiation at night—is an active agent of the winds in abrading. In many places it has planed the flat rocks of the *hammada* as smooth as ice. Elsewhere it has scored the vertical faces of the cliffs with curious imitations of glacial striation and has helped to undercut the pillars or table-like eminences which, under the name of *gurs* or "witnesses," are among the most familiar products of Saharan erosion.

As to the elevation of the Sahara, some responsible general estimates have been made within the past few years. The Upper Sahara consists of a rocky plateau, never less than thirteen hundred feet high, which rises at times in considerable peaks; the lower, to which the plateau descends by a steep slope, is a vast depression of clay and sand, usually from two to three hundred feet above sea-level. Scientific investigation of the desert has shown that the soil there lacks no element

(Continued on page 124.)

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

Information on Plumbing.

To the Editor of the SCIENTIFIC AMERICAN:

"A Plumbing Improvement Wanted," page 113, issue of February 3rd, 1912. Please inform "master plumber" that he should make a globe of thin copper, then cover with India rubber for the valves. These would float all right and resist external pressure, and the outer covering of India rubber would make the water-tight joint when required.

JOHN WM. MCBEATH,
Fellow Chemical Society.

Kimberley, Cape Colony, Africa.

The Laxey Waterwheel

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of April 13th, page 336, referring to the Laxey waterwheel, you state that it was built about 1865.

I went to the Isle of Man in June, 1859, and went to Laxey in September to visit the lead mines there, and at that time the great wheel had been at work some few years; how many, I cannot now remember, after such a long lapse of years. The above date is the more fixed in my memory, as I was then a boy of eighteen, and this journey to the Isle of Man was my first job.

THOMAS J. WOOD.

Itajuliá, Minas Geraes, Brazil.

Restraining the Floods

To the Editor of the SCIENTIFIC AMERICAN:

I have been a subscriber many years. Just finished your article on the Mississippi River (May 25th, page 475). You have a very good illustration for a levee.

The writer piloted on the Mississippi River and the Illinois River fourteen years. Lived in Cairo, Ill., forty years. Was mayor of that city from 1895 to 1897. In 1898 took a trip through Europe. Noticed in Germany the farms were ditched in zigzag fashion; ditches from eight to ten feet wide and about same depth; many miles across the country. They plant willows all along the banks of the ditches. The young sprouts are made into trunks and baskets, which is a very large industry.

These ditches really form a grand system of irrigation. The crops looked fine—healthy and abundant. Water runs along slowly, avoiding the rush of the water into creeks, and rivers have water all summer. In our country we dig straight ditches, which produce overflows during spring freshets, that increase each year as the lowlands are opened up for cultivation. I can remember rises at Cairo, Ill., with high-water marks of 45, 47, 52 feet, and this year 54 feet from low-water mark, a steady increase each flood year.

When you think of making levees in the years to come, I doubt if the States or Government combined can build levees of sufficient height to protect the Southern States, without bankrupting the States and the Government; and with the best of levees there is a continual danger of breaking some of them.

Lockport, N. Y. C. R. WOODWARD.

The Wireless Meddler Again

To the Editor of the SCIENTIFIC AMERICAN:

While the question of amateur interference on the Atlantic coast is under discussion in your correspondence columns, I feel that it might not be amiss for me to add what information I can as to the situation on the Pacific coast.

Amateur stations are as plentiful in the neighborhood of San Francisco Bay as anywhere in the country, and I cannot but feel that the conditions here are a fair example of what is to be met in any part of the country.

I had the good fortune to be listening in at the time of two separate distress messages from vessels here. On the first occasion, the steamer "Beaver" had rammed the Norwegian tramp "Selja" and barely succeeded in rescuing her crew before she sank. The "Beaver" herself was badly damaged, so that the captain felt it prudent to call for aid. At the first S.O.S., nearly every station, amateur and professional, within receiving distance started to answer, but within three minutes of the first call for help, the United Wireless station at San Francisco had a clear line, and was exchanging messages as fast as the apparatus could be worked. Amateurs who started to work during the distress messages were so promptly silenced by other amateurs in their neighborhood that the interference from this source was almost negligible. The main interference came from other commercial stations, who were ignorant of the nature of the business being transacted at the time. Interference was also caused by both stations of a wireless telephone company in the locality, who refused to stop operating until called upon several times to do so. To my mind, the first restrictions to be placed upon wireless work of any kind should fall upon these wireless telephone companies, since the range of disturbance that they create is far greater than that of the average amateur.

The other distress message which I happened to hear was from the steamer "Queen," which had caught fire in the foreward hold. The messages in this case were given religious consideration by all amateurs.

Either the navy stations on this coast differ widely from those on the Atlantic, or somebody is mistaken when they claim that apparatus in such places is antiquated. I know of no better apparatus than the Telefunken sets now being installed at the Government stations. And as for operators, the average Government man, on this coast, at least, can rank with the best in the world. In any station, however, local interference may at times prevent the reception of messages clearly audible at some other nearby station. I think this will explain Mr. Powell's statement in regard to this matter.

Legislation on this subject should only be undertaken with a full knowledge of existing conditions, and of how to better them, and petitions signed by those entirely ignorant of the situation should not be granted any weight in deciding this matter.

Berkeley, Cal. FRANK RIEBER.

High Speed Through the Ice Fields

To the Editor of the SCIENTIFIC AMERICAN:

The editorial upon this subject in your number for July 6th, with its conclusion that high speeds will probably be maintained in the future, raised a line of thought in my mind which I have not seen heretofore discussed. The iceberg which was fatal to the "Titanic" was, I believe, discovered by her lookout about 30 seconds before she struck it. The "Titanic" was traveling at a speed of 22 knots, and the berg was, therefore, originally seen at a distance of 1,100 feet.

Let us first assume, what is approximately the fact, that the radius of curvature of a vessel's track, when her rudder is turned, is the same at all reasonable speeds. Then if the rudder of the "Titanic" had been instantaneously turned, it would have made no difference at what speed she was going, she would have followed precisely the same course, although the amount of damage inflicted would naturally have differed somewhat with the speed of collision. If at less speed the radius of curvature were somewhat larger than at high, which is really the case, the berg could have been more surely avoided at the higher speed.

The point which I wish to raise, however, is that the rudder could not possibly have been instantaneously turned. After the lookout first glimpsed the berg through the darkness, it took him an appreciable time, let us say 5 seconds, to make up his mind that it really was a berg, and to shout to the officer on the bridge. To attract the officer's attention, for him to receive the information, and to step to the engineer's signal, required let us say 5 more seconds. To call the engineer's attention, and to transmit the signal to change the course of the ship required, let us say 5 seconds. To turn the lever and shift the rudder by the required amount required, let us say, 5 more seconds; 20 seconds in all, out of the possible 30. Some of these estimates may be too large, and some too small, but the total 20 seconds cannot be very far out of the way. The ship, therefore, had 10 seconds left, after the rudder was completely turned, in which to change her course.

If now she had been going at half speed the berg would still have been sighted at 1,100 feet distance, but it would have taken the ship 60 seconds to reach it, and the vessel would have had 40 seconds in which to make the turn to avoid it. When she first began to turn she would then have been twice as far from the berg, and since for small arcs the deviation, $1-\cos$, varies as the square of the arc, had she followed the same radius of curvature, at the end of the 1,100 feet she would have been four times farther from her original course than if she had gone at full speed. Even if the radius of curvature of her course were twice as great, she would still have been twice as far from her original course. This would certainly have saved the ship.

Mr. Ismay's point that the higher the speed the less the danger, because the ship would the sooner be through the danger zone, does not appear tenable to the writer. As applied to fog there is undoubtedly an element of truth in it, because one of the dangers of fog is that of being run down by other fast boats. The longer you stay in a foggy region the more boats will cross your track. A slow boat should get through a fog just as quickly as she can. With ice this is not the case, since the speed of the ice compared to that of the ship is so small as to be practically negligible. We may consider it merely as so many islands. All the danger depends on the ship herself. Consequently, the element of time does not enter at all, only distance. Whether she is but one hour or ten hours in the ice is equally dangerous, provided her course is the same.

In conclusion, I would like to add that while the large boat is undoubtedly more economical to run, more stable, more luxurious, and in some respects safer than the small one, yet when it is a question of either fog or ice, the smaller one has the distinct advantage that while the obstacle is visible from both ships at the same distance, the smaller one can in the same time, even if going at the same speed, change her course through a greater amount to avoid it, and is, therefore, in this respect the safer of the two. A smaller boat could undoubtedly have avoided this particular berg.

WILLIAM H. PICKERING.

Harvard Astronomical Station, Mandeville, Jamaica, W. I.

The Cause of the Quimby Accident

To the Editor of the SCIENTIFIC AMERICAN:

You will recall that in the July 20th issue you published my account of the Quimby accident. Underneath it you gave the substance of a conversation with Miss Quimby's mechanic.

In spite of the general misunderstanding on this Quimby accident, I believe there was never anything clearer. Let me furnish you some further evidence.

When I went in the boat to examine the wreck of Miss Quimby's machine I asked Capt. Chase, acting chief signal officer of the United States Army, if he would accompany me, as he had been sent by the Government to pick up whatever he could at the aviation meet. He did so. As we were rowed out to the wreck he asked me whether I noticed that the machine had turned to the left and that Miss Quimby and Mr. Willard were not only thrown out, but to the right. I said that I had noticed this. Mind you, all of this occurred before we had seen the wrecked monoplane. In other words, we had both agreed that the machine turned to the left just as it plunged downward.

When we reached the wreck I scrambled on top of it, and the first thing I saw was the rudder wire caught over the lower end of the warping lever. The mechanic had come out in another boat, and he, too, climbed onto the wreck. I pointed out the caught wire to him, and he held up his finger, and said, how did I know that the wire was caught in the air? He went on further to say that he believed it had been caught after the machine struck the water or on the way down. I replied that of course that question could never be settled, but the fact that it was so caught proved defective design. He then, in the presence of myself, Capt. Chase, and Mr. Thorndike, who rowed Capt. Chase and myself out in his little boat, unhooked the wire from the lower end of the warping lever.

I cannot see how he could be so short-sighted as to say that he did not do this, or that the warping lever was not caught.

In my own defense I have written to Capt. Chase and Mr. Thorndike and asked them to give me an affidavit stating that the wire was caught as I indicated. I inclose copies of the affidavits.

If you examine my sketch, you will see that by the wire catching as indicated the rudder would be thrown to the left and the monoplane turned toward the left as it plunged downward. Does it not seem that it is something more than mere coincidence that both Capt. Chase and myself agreed before we knew anything about this caught control that the aeroplane turned to the left?

I have plenty of evidence to prove that the wire was caught as I say, and it seems to me that the circumstantial evidence goes to prove that it was caught in the air. However, there is one thing that is certain, and that is that the machine should not have been constructed so that the wire could have become caught under any circumstances whatever.

In justice to myself I would much appreciate it if you will publish this affidavit of Mr. Thorndike's with the statements which I have made in this letter regarding the fact that Capt. Chase and myself both agreed the monoplane turned to the left before we knew anything about the controls being caught.

The idea of Willard jumping out or falling out is all nonsense. As the tail of the machine went up and to the right he was thrown out twenty-five or thirty-five feet as a hundred witnesses will testify. The fact that he went much further than Miss Quimby is, of course, easily explained when one realizes that he sat nearer the tail than she did, and because he went so far it gave the idea that he jumped. Assuming he had wanted to jump from a monoplane moving seventy miles an hour, he could not have jumped twenty-five feet. With the wind resistance against his body it would have been about all he could do to flop over the side of the machine, but as it was he was thrown far up and out, while Miss Quimby went below him.

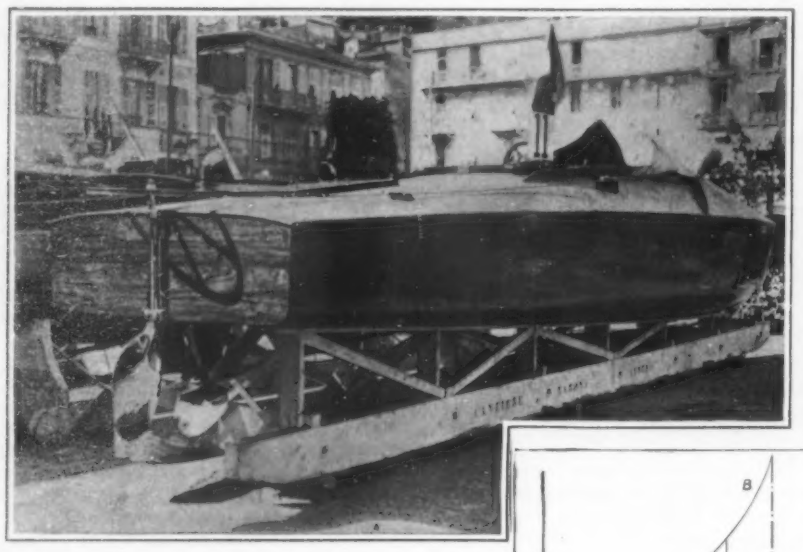
Newton Highlands, Mass. EARLE L. OVINGTON.

[The affidavits of Mr. Thorndike and Capt. Chase, referred to by Mr. Ovington, have been received. They agree with his account. Lack of space prevents our publishing them.—EDITOR.]

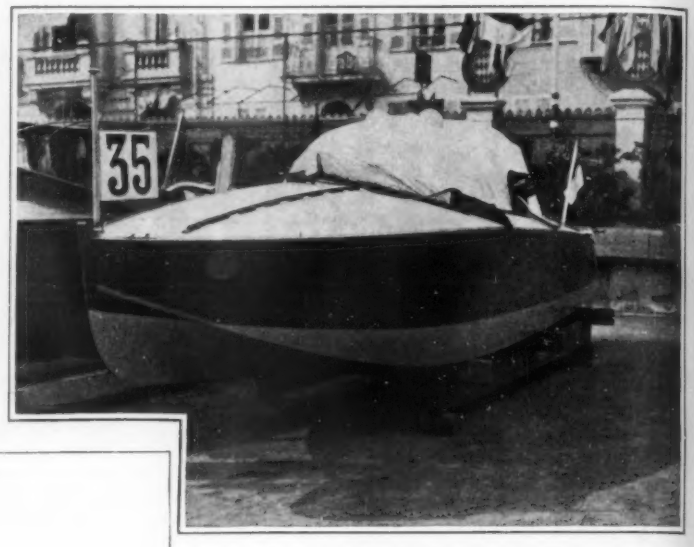
What is a Hydroplane?

The Evolution of a New Type of Craft

By Joseph B. Baker



A type of hydroplane without a sharp forefoot, and planing.



A type of hydroplane with a sharp forefoot, and planing.

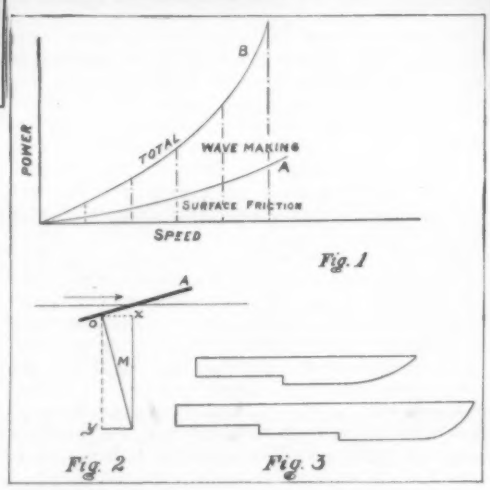


Fig. 1

Fig. 2 Fig. 3

Fig. 1.—Diagram indicating roughly how the power required to drive a boat rises with the speed, due to wave-making of immersed surface. Fig. 2.—Diagram showing the upward thrust due to motion of plane at an angle with the resisting medium. Fig. 3.—Single-step and two-step hydroplanes.

THE attainment of high speed in water craft has been a fascinating problem ever since man began to venture upon the water. The oared vessels of the ancient maritime peoples, propelled by many galley-slaves laboring at banks of oars, the triremes in which the sea battles of the Greeks and Romans were fought, the speedy oar and sail ships of the Norse Vikings, the war canoes of the American Indians, were all pushed hard upon occasion, to get the utmost possible speed. But these craft one and all were creatures of limitation; the boat, man's water-going invention, could not hope really to command the sea until steam became available for marine propulsion, replacing human muscle and the capricious aid of the wind by a mechanical power which could be increased indefinitely.

The application of steam opened up a new era; but though vessel speeds were greatly increased, the ability to eat up the miles on the water as the railroad train does on land was by no means attained. It might be thought that the speed of an engine-driven vessel would be merely a matter of motive power—that in order to increase the speed one must simply put in a larger, more powerful engine. But such is not the case, as the designers of steam craft in the first few decades following Robert Fulton's great demonstration soon found out. So far from the speed of the vessel being proportional to the engine power, or in anything like that ratio, it was found that above a certain speed—depending on the design of the hull—it did little good to increase the power. The work of the engine, delivered through side-wheels, stern-wheel or propeller, was expended in urging the mass through the water on which it floated. The ordinary boat is a structure which sinks till it has displaced a weight of water equal to its own weight, and in all boats this means that the immersed surface presents a considerable resistance to the forward urging of the wheels or propeller. Shaping the surface to give the easiest possible passage through the water, by refinements of marine architecture based on the study of stream lines, fluid friction and the friction of the supporting fluid on the surfaces of the immersed part of the hull, reduces this retardation. But with the easiest sliding hull that could be built to give the required displacement consistent with seaworthiness, there is an inevitable limit to the increase of speed with increase of power—a limit beyond which it does not pay to put in a larger engine simply because at most a trifling increase of speed is obtained thereby. Any attempts to exceed this "critical speed" result in an abnormally heavy and bulky motive power and correspondingly great weight of fuel required to be carried and space alloted to fuel, a condition inimical to cargo carrying capacity and sometimes also to seaworthiness, and permissible only in war vessels and racing boats, where high speed at any cost is the ruling consideration.

The introduction of gas engines as motive power, giving rise to that remarkable product of the past fifteen years, the motor boat, helped the speed problem wonderfully by enabling a much larger power to be realized from a given weight and space of material in the engine and in the fuel carried (gasoline). Motor boats have set an entirely new standard of marine speeds through the use of an engine which is of small weight and size compared to the steam engine with its boiler and coal, and which allows the hull to be designed with finer lines. But notwithstanding the extension of the speed possibilities thus gained, the fluid resistance of the hull as an immersed surface largely remains to limit the speeds attainable. In brief: As long as the craft presents a considerable immersed surface it must be driven *through* the water, and, therefore, encounters a resistance which rises very rapidly with the speed. Without dwelling on technicalities we may note in passing that the fluid resistance to a boat's motion is made up of two parts, viz., surface friction and wave-making. As shown roughly in the annexed diagram (Fig. 1), whereas the surface friction (the lower ordinates) increases as the square of the speed, the power consumed in wave-making increases very much more rapidly, that is, at an increasingly rapid *rate* of increase. This wave-making resistance is due to the displacement of water by the moving boat.

But if one can avoid driving the craft through the water at all? If we can drive it *over* the water we can largely reduce the displacement resistance, which cuts such a figure in an immersed boat, and at the same time very considerably reduce the skin friction, making our curve of power consumption approximate curve *A* with short ordinates, since the immersed surface is much reduced. Then we shall be utilizing the principle which keeps a well-thrown "skipping-stone" flying for a long distance over the water, just as the aeroplane utilizes the principle which keeps a kite aloft.

The very consciousness of a need leads to its supply. The step from the ordinary boat to the hydroplane has been taken in response to the need of higher speed on the water, just as the step from the balloon to the aeroplane was taken in response to man's need of control and speed in the air. Both of these improvements have come from abandoning the supporting quality of mere volume displacement, and utilizing the supporting quality due to resistance to a plane driven at high speed. The hydroplane has a bottom structure which, though heavier than its displaced water, yet stays on the surface like a skipping-stone by constantly moving

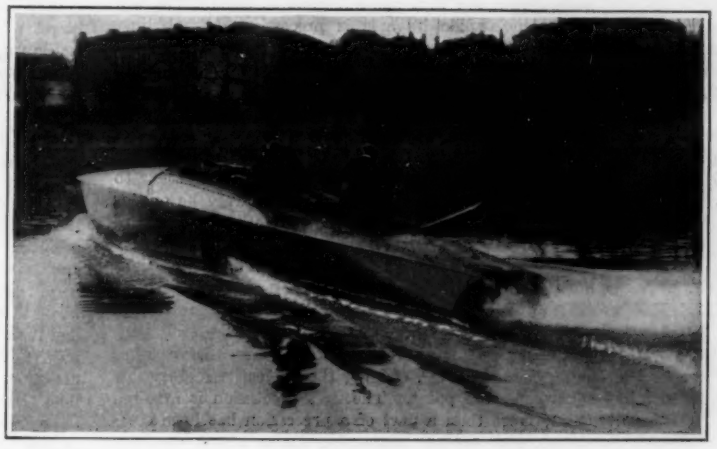
"Elcoplane," the great rival of "Dixie Jr."

"Vita Jr.," the latest 1912 type. Note the front rudder.

on the water; the aeroplane is a heavier-than-air structure which stays up like a kite by continually moving against the air. The hydroplane is upheld because its velocity develops a sufficient upward thrust of the water over which it is passing, just as the aeroplane is upheld because its velocity develops a sufficient upward thrust of the air through which it is passing.

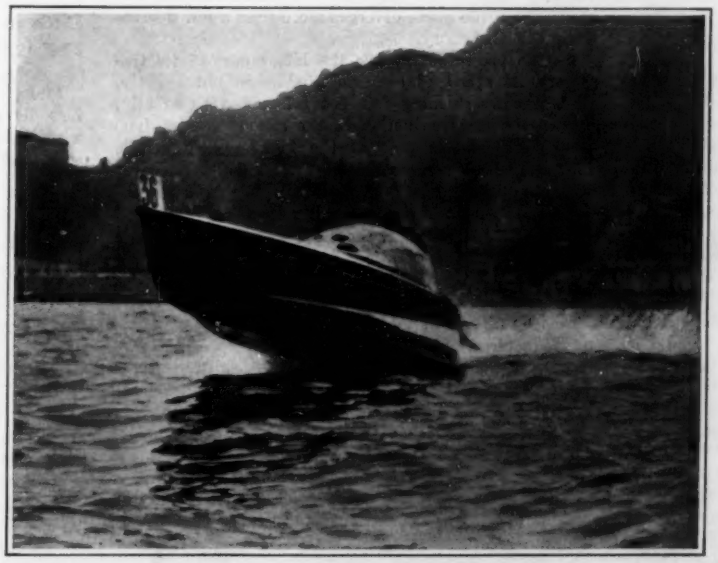
The hydroplane is a vessel designed for two features of performance: 1. To rise out of the water when driven, owing to a very strong upward thrust on its hull and a light total weight which the upper thrust can lift. 2. To offer the minimum friction resistance at speed. These features, in a craft having a powerful gasoline engine and manned by a competent crew, result in high speed. The hydroplane is driven faster than an ordinary boat, by an engine of given horsepower, because it is lifted up on top of the water and kept there; the power of the propeller exerted to drive the craft ahead also develops an upward thrust on the hull by reason of the plane bottom of the hull. Let us look more closely at this matter of upward thrust. Consider a heavy plank or plane, driven through the water in a direction making a slight angle with itself. The total resistance to the direction of motion may be resolved into components, one parallel to the plane and one normal to it. The former involves the skin friction; it is the latter which involves the levitating action of the plane. Let *A*, Fig. 2, represent the plane, and *M* this normal component which we may resolve into two components *Ox*, a horizontal drag tending to retard the motion of the plane, and *Oy*, a vertical lift on the plane. If now the speed of the plane is high enough in proportion to its weight, that is, if this component *Oy* is great enough to lift the weight of the plane, the latter will rise. The diagram shows that in order to obtain an advantage from the use of such a plane fixed on the bottom of a vessel, the benefit of the lift due to the plane must outweigh the drag and friction of the same—the latter diminishing, of course, as the craft rises on account of the diminution of immersed surface. It is all a matter of the ratio of the power of the craft to its weight. The idea itself is not new: plane boats equipped with powerful steam engines had been built before the present hydroplanes, but until the gasoline engine with its high weight efficiency was applied to motor boat propulsion, the weight of the power plant and of the hull required to contain the same was too great for the lifting force.[1] With the gasoline engine, itself of light weight for large power and capable of installation in a light hull having a bottom designed with one or more planes, the lifting energy was able to force the structure up out of the water; and the characteristic high speed of this craft at once resulted, owing to the reduction of wave-making and surface friction.

It is instructive to trace the performance of the hydroplane, its position with regard to the water as the speed is increased from zero to the maximum of which the vessel is capable. Take the simplest construction, the so-called monoplane (upper sketch, Fig. 3). At rest, this craft floats in the water like any other boat, being supported by its static buoyancy. When the engine is started, the resistance of the plane bottom causes the bow to rise; but ordinary buoyancy is still the ruling factor, and the stern sinks until the additional immersion of the after part displaces enough volume of water to support the boat. As the speed increases, the further rising of the bow moves the center of upward thrust back, until it reaches almost to the center of gravity of the craft. At this stage of the speed, since the point of support is very near the center of gravity, the boat is ready to pivot vertically, so to speak, upon this point; and with further increase of speed the boat, powerfully upheld by the vertical component of the fluid pressure on its bottom, drops its bow, but raises its stern, till its bottom rests on the surface of the water at a small angle therewith, and with very little displacement of water compared with that in the position of the boat when at rest. The main factor is no longer static buoyancy, but the new lifting force due to the speed of the boat. This is the planing position; the power of the engine is showing a speed which could never be attained in an ordinary boat with a displacement hull. If the speed is still further increased, the bow may be sharply depressed, causing the craft to dive headlong. The hydroplane may be built with a single plane or "step" or it may have two or more steps, as shown in Fig. 3. These are over-water hydroplanes. A type in which the upward thrust is given by totally immersed planes has been successfully demonstrated by Mr. Peter Cooper Hewitt in this country and by Signor Enrico Forlanini abroad. It is to the over-water hydroplane that we owe the phenomenal advance in boat speeds in recent years. The 21 miles per hour of the "Vingt et un" ten years ago, a speed unheard of up to that time, has to-day been more than doubled, the "Dixie IV," the fastest boat in the world, making 46 miles. Attention to detail, refinement of design and the cutting down of weight enables this American-built craft of 500 horse-power to beat foreign boats having over 800 horse-power. The same speed qualities are shown in smaller boats of this type also; a craft new this year and only 20 feet long has shown a speed of 38 miles per hour.



A hydroplane at low speed, not planing.

"Baby Reliance," a new type for 1912. Built in May.



The "Saurer Lurssen" hydroplane at full speed.

Copyright 1912 by Edwin Levick.

20-foot "Dixie Jr.," with a speed of 43.78 miles per hour.

The average of five runs in a speed trial of the 20-foot "Dixie, Jr.," hydroplane, over a course one mile long in Newark Bay, June 21st, showed a speed of 43.13 miles per hour; the best performance being 1 minute 22 1/5 seconds for the run north, which figures out 43.78 miles per hour. It is safe to say that this speed is as fast as any 20-footer has ever traveled. This boat is owned by Mr. Harry Payne Whitney. Next year may show us 50 miles per hour in a 40-foot boat. The use of the Government tanks at Washington, D. C., for testing out large-size models has been of great assistance in developing the lines of these vessels. This year will see our British cousins here again—their challenge has been received—to try to win back the Harmsworth trophy; and there may be other foreign boats in the contest. Will some scientific American prove equal to the task of defending it?

The Value of Radium

THERE are no very exact statistics of radium available, but according to the United States Geological Survey the whole quantity in the world is probably not over two or three ounces, and its value, like that of the big diamonds of the world, is purely nominal. It is worth whatever the possessors can get for it. The head of the English corporation producing radium claims that it is worth approximately $100,000,000 a pound. A year ago this same person had estimated the value of radium at one third more. However, a little variation of $50,000,000 is not thought to matter where there is no appreciable fraction of a pound of the precious stuff in sight. The fact that has more than anything else to do with fixing the price is the existence of several radium banks in the world where tubes containing a microscopic speck of radium are rented out to doctors at something like $50 a day. While it is known to be of some value in treating lupus, which is a form of tuberculosis attacking the tissues, usually of the face, there is little else known about its medical value. It has been claimed on several occasions that radium was valuable in the treatment of cancer, but experiments have not proved this to be an absolute fact.

A short time ago it was reported that the Austrian government had purchased the only two mines under private ownership producing the ores from which radium is made, and thereby gained a monopoly in its manufacture. This report, however, turned out inaccurate. It is true that the Austrian mines and the Austrian government heretofore have supplied the bulk of the radium salts existing in the world, but at the present time radium is being manufactured in three other countries, the United States included. Sweden is producing radium from kolm, the English are getting it from mines in Wales, while we get it from western Colorado, where there is a large deposit of radium-producing ore. These deposits produce also uranium and vanadium, the latter being used for making some of the high-grade steel alloys. While the mining pays in vanadium alone, the ore produces a certain per cent of radium. Ten tons of it procure only between twenty and thirty milligrammes of radium.

[1] Nearly fifty years ago Mr. Ramus, a clergyman, conceived the idea of driving vessels over the water instead of through it, and tried his scheme in the British Admiralty experimental tank at Torquay; but it failed because of the poor ratio of power to weight.

The Flight of Projectiles

The Actual Positions of a Shell from Gun to Target

By Rear-Admiral N. C. Twining, U. S. N., Chief of the Bureau of Ordnance

"THE axis of a projectile in flight is at all times sensibly tangent to the trajectory." Sketch No. 1 shows the positions which a projectile takes in the different parts of its trajectory.

A large number of persons believe, however, that the axis of a projectile in flight remains parallel to its direction when fired. These persons believe the positions of the projectile to be as shown in sketch No. 2.

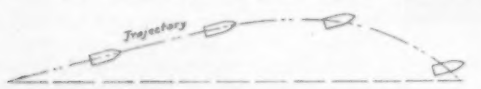
It will be sufficient for the present to state that these persons (of whom there are a surprisingly large number) are wholly in error, and that a projectile in flight cannot possibly take the positions shown in sketch No. 2.

Sketch No. 1.—Shows actual position of projectile during flight from gun to target.

The discussion as to whether sketch No. 1 or sketch No. 2 is correct has continued for many years, and has long been considered a moot question. It has frequently been stated that authorities differ on this question. This is not quite true, for it will be found on investigation that all "authorities" are of the same opinion. There is absolutely no doubt that the believers in sketch No. 1 are correct, and that those who believe in sketch No. 2 are in error.

It is important to establish the correctness of sketch No. 1, as many articles and criticisms have been written on the premise that sketch No. 2 is correct, and consequently a great deal of mis-information has been placed in print, and a great many incorrect deductions have been made.

In investigating the flight of projectiles, it is not apparent why so many have been led to believe that sketch No. 2 is correct. There is neither theory nor



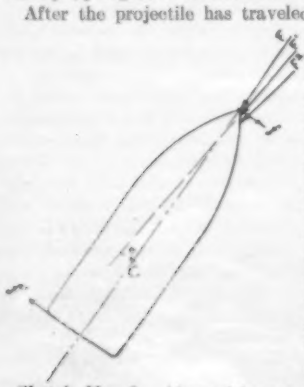
Sketch No. 2.—False idea of positions of projectile during flight.

fact to support such belief. It is stated that owing to the "gyroscopic principle," a projectile will remain parallel to its original direction. The assumption is wholly incorrect, for although a rotating projectile is a gyroscope, there is no gyroscopic principle which allows a projectile to remain parallel to itself while it is being acted on by the force of the air resistance.

When a rotating projectile is fired from a gun, the air resistance is at first head on, acting in a line through the center of gravity of the projectile. This force merely retards the projectile.

Reference to sketch No. 1 shows that the direction of the air resistance is continually changing. At first it is head on and downward; later it is horizontal; and at the end of flight the air resistance is upward. The change of direction of the air resistance in the first part of the trajectory, may be taken as approximately ¼ degree in a thousand feet.

After the projectile has traveled a short distance in its trajectory the direction of the air resistance changes, bending toward the horizontal, the resultant force striking the projectile as at F', sketch No. 3. The force F' does not act through the center of gravity of the projectile, but forward of it, creating a small overturning moment, or "gyroscopic moment," represented by $F'.a$. If there were no rotation this moment would tend to overturn the projectile; but as the projectile is rotating, the overturning moment causes the projectile to begin to precess about a line passing through the center of gravity of the projectile and parallel to the direction of the force F'. This line is sensibly the direction of the trajectory.



Sketch No. 3.—Air resistance against projectile during flight.

The force F' strikes under the point of the projectile, and if the projectile has right-hand rotation, it will start precessing to the right. The projectile behaves quite like a top that has not gone to sleep. The top is rotating, while its axis is precessing or wabbling. There is this difference, however, that the top makes a number of complete precessions, while the projectile makes only partial ones, as will be explained. It must be understood that owing to the high speed of rotation of the projectile (4,000 to 20,000 revolutions per minute, or even greater), and the relatively small overturning moment of the air resistance, the time necessary to make a complete precession would probably be one or more seconds, depending on the projectile, its speed of rotation, and the overturning moment. If the overturning moment decreases, the speed of the precessions decreases.

Before the projectile has finished more than a part of a complete precession, it has traveled several hundred feet, and the direction of the air resistance has again changed to F^2, striking the projectile slightly farther under the point. The first precession is arrested before more than a part of a precession has been completed, and another precession starts about the new direction of the air resistance, the point of the projectile again bearing off to the right (as viewed from the rear). As the direction of the air resistance changes again and again, new precessions are started before previous ones are more than partly completed. The point of the projectile, therefore, describes a series of cusps, the horizontal traces of which are practically cycloids, appearing somewhat as shown in sketch No. 4. The point of the projectile for right-handed twist remains for the most part to the right of the vertical plane of the trajectory.

The overturning moment (which depends on the air resistance and the lever arm) is balanced in a sense by the speed of the precession. With a given speed of rotation of a projectile, if the overturning moment decreases, the precessions become of greater period. As the changes in direction of the air resistance are relatively small, and as new precessions are started with every considerable change of direction, it follows that the amplitude of the precessions is small, and the axis of the projectile never diverges more than a few degrees from the trajectory.

As the projectile reaches the latter part of its trajectory its speed of rotation diminishes but slightly, while the overturning moment falls off very greatly, due to the large reduction in the air resistance. The precessions in this part of the flight are, therefore, slower, and of greater amplitude. This is indicated in sketch No. 4.

In addition to the overturning moment caused by the resistance of the air, there are also frictional forces which oppose the rotation of the projectile. These forces act at right angles to the head-on resistance, and the effect over the whole projectile may be represented by a force at each end of the projectile acting in opposite directions, as shown in sketch No. 3. These forces are the equivalent of a force f-f^1, acting through the center of gravity, and a couple tending to depress the axis of the projectile toward the trajectory.

As soon as the axis of the projectile becomes tangent to the trajectory, the friction forces disappear, as the friction then becomes symmetrical about the axis.

The force f-f^1 moves the projectile bodily sidewise, and is one of the elements causing drift. The friction couple assists in keeping the axis of the projectile tangent to the trajectory.

This friction force is quite like the friction acting on the peg of a top. The axis of the top is finally brought into line with the direction of the force of gravity by the friction on the peg acting at right angles to the force of gravity.

There is absolutely no proof, theoretical or otherwise, that a projectile in flight will remain parallel to its direction when fired, while the theory of gyroscopes shows plainly that the direction of the axis of the projectile must depress continually to meet the changing direction of the air resistance.

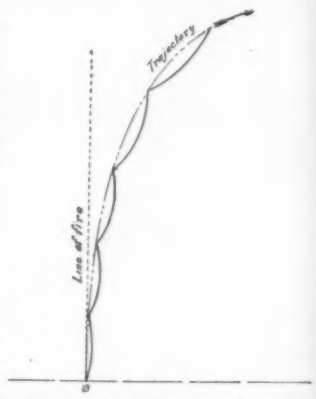
In addition to the theory, the following tangible proofs show conclusively that the axis of the projectile is at all times sensibly tangent to the trajectory:

(*a*) Cardboard impact.
(*b*) Photographs.
(*c*) Reports of observers.
(*d*) Reproduction of motions with air currents and model projectile.
(*e*) Penetration of armor.
(*f*) Retardation of velocity in flight.
(*g*) Explanation of drift.
(*h*) High-angle fire.

Cardboard Impact.

It is evident that if a projectile in flight should hit a target which offered practically no resistance, the projectile would pass through the target without being deflected, and would make in the target a hole indicating the position of the projectile in flight.

In October, 1909, at the Naval Proving Ground, Indian Head, Md., firing took place with an 8-inch gun at a cardboard screen, the range being 7,600 yards. The angle of elevation of the gun was about 9 degrees, 30 minutes, and the angle of fall 13 degrees, 45 minutes. Reference to sketch No. 5 will show that if the projectile had remained parallel to its original direction, an oblong hole would have been made in the cardboard about 15.35 seconds in length. The hole actually made in the cardboard was practically circular, having a diameter of about 8.23 seconds. This evidence is conclusive that the axis of the projectile must have been practically tangent to its trajectory.



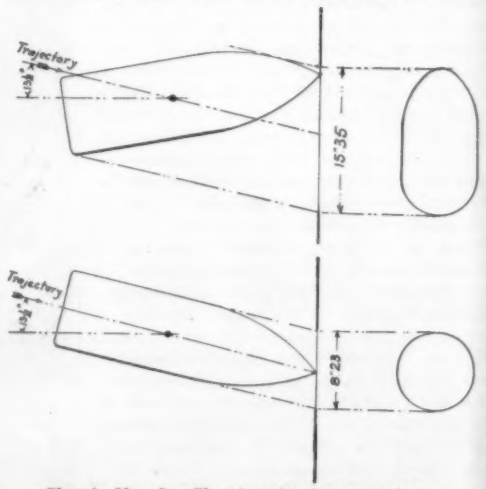
Sketch No. 4.—Path of point of projectile, shown on horizontal plane.

Photographs.

During the target practice of the Atlantic fleet in the spring of 1912, actual photographs were taken of large-caliber projectiles in flight. The photographs were taken after the projectiles had traveled about 10,000 yards. In all of these photographs the projectiles are seen traveling point down, with their axes practically in the trajectories. Measurements showed that the axes of the projectiles at this range diverged less than 2 degrees from the tangents to their trajectories.

Reports of Observers.

Many observers at target practice, and at other firings, have reported seeing projectiles in flight striking with their points following the trajectories. In no instance has any report been received of a projectile falling



Sketch No. 5.—Showing by impact of projectile on card, actual position during flight.

point up, as in sketch No. 2. Observers of mortar firing have reported that the axis of the projectile, both in the ascending branch and in the descending branch, follows the trajectory.

(*To be continued.*)

Lotschberg Tunnel Approaching Completion.—The Lotschberg tunnel, which has been driven through the mountain on the right bank of the Rhone, and which will form an outlet from the Simplon tunnel to the northward, is practically completed. The tunnel carries a double-track railroad and is lined throughout its full length, which is slightly over 9 miles, or 47,676 feet.

Suggestions for the Workshop

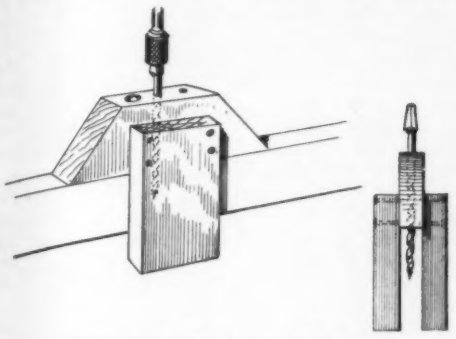
Ingenious Expedients of Resourceful Mechanics

Gage for Boring Dowel-pin Holes

By William Grötzinger

IT is often a difficult matter to bore straight dowel-pin holes in two pieces of wood, which are to fit together squarely and tightly. The following description of a gage for the purpose should be readily understood:

It is made from a piece of oak board, with two side



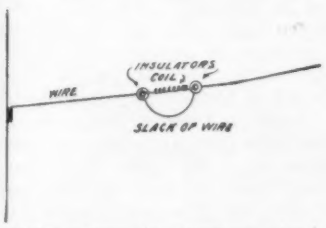
Gage for boring dowel-pin holes.

pieces screwed so as to form a socket in which the work fits and is held squarely. A number of different size holes are bored into the oak piece, so that bits of different sizes can be used, for large or small dowel-pins. Mark the work with a pencil where the holes are to be bored, put the gage over the work, and put the bit in the holes of the desired size. Be sure to get the bit on the pencil mark, then bore the hole. If the gage happens to fit a little loosely, it can easily be made tight by wedging it with small wooden wedges.

Reducing Noise of Telephone Wires

By R. D. Mock

A WIRE, especially one with a long span, is sometimes a noisy proposition when it is attached to the clapboards of a house. Every time the wind blows a little harder than usual there is such a moaning and groaning that sleep is well-nigh impossible. The wire seems to make a noise on the principle of the old-fashioned squawker boys used to make out of a tin can with a stout thread fastened to the bottom of it. Pulling the thread would produce a fiendish noise. And every time the wind would make the wire give a pull on the house, it would sound like that old tin can. In my case, the telephone wires were the offenders.



Noise reducer for telephone wires.

The next time a lineman was in the neighborhood I got him to give me about a foot of slack on each line. Two very stiff coil springs and two pairs of porcelain insulators then did the work. Each wire was wrapped around two of the insulators in the regular way and then a spring was inserted between the two, as may be seen in the diagram. The other wire was handled in the same manner. The spring was stiff enough to draw the wire up to nearly its usual tautness, and yet it was elastic enough to take up all the jerks and unusual pulls that formerly made so much noise. Everybody slept much better on blustery nights after this. Of course the main thing is to get a stiff enough spring so that the wind will not pull it out.

A Cheap Pipe Wrench

By H. C. Urbaner

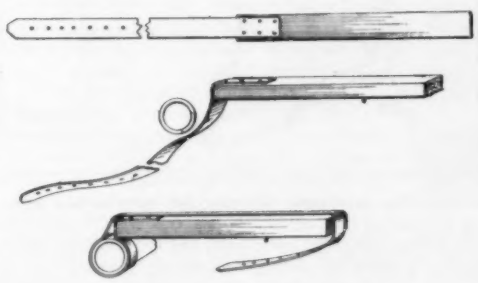
QUITE frequently it becomes necessary to have a pipe wrench, especially for brass tubing, that will not mar the work and yet at the same time will permit of using sufficient force to produce the required results without crushing the tubing.

Fig. 1 shows one of the cheapest, simplest, and yet most efficient of pipe wrenches. It consists of two parts: A piece of hard wood about 1½ × 1½ × 18 and a piece of strong 2-inch leather belting about 3 feet long. The strap should be riveted to the wood with rivet heads well sunk below the surface of the wood on the side opposite the strap side of the lever. The loose end of the strap should have holes punched at intervals of one inch or so to make it adjustable to the work with the stud the opposite side of the bar. The strap should be turned down over the end of the lever, then up and around the work and back along the top of the lever and around the opposite end, where it is fastened to the stud on the under side. The object of throwing the strap around the end of the lever rather than to fasten it at the end is to insure a maximum amount of pull on the strap with a minimum strain where it is fastened to the stud. Use this device like any other pipe wrench. To release the wrench for another pull, simply pull it away from the pipe far enough to allow it to loosen its grip and begin for the new pull by simply repeating the first operation. The end of the strap must not be taken from the stud after it is adjusted until the operation of turning the pipe is completed.

With the use of this wrench, an even strain is placed upon the tubing on its entire surface without any possible danger of marring or crushing it.

With a few trials the work can be done as quickly as with an open pipe wrench.

The writer has employed this idea in many different ways, and finds it most helpful. When a fountain pen



Pipe wrench for polished brass.

cap "sticks" take a little stick and a piece of dampened cord and in a moment it is loose.

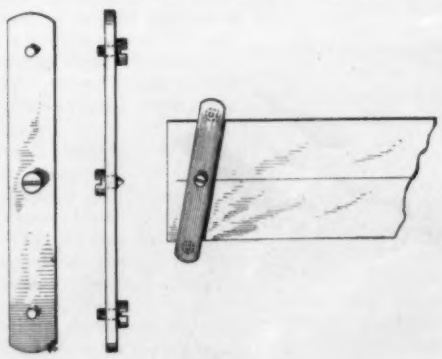
A few years ago the writer had occasion to unscrew the first joint of a 2-inch pipe in a tubular well in order to find the end of a broken wooden rod inside. As no large pipe wrench was at hand one was made as here described from a 4-foot piece of oak scantling and a strip of 1/16 × 2-inch hoop iron purloined from a vinegar barrel. After setting the wrench two strong men pulled on the 4-foot lever with all their strength to start the pipe.

Center-line Gage

By Henry Klotz

THE accompanying sketch shows a handy little tool which for want of a better name I call a center-line gage. It is very useful on many jobs, and is easily made as follows: A piece of iron or steel about ⅛ inch thick and 1 inch wide is drilled and tapped to receive three screws as shown in drawing. The point of the center screw can be hardened so as to wear better, but this is not essential, as it can easily be sharpened when dull and replaced in position.

When it is desired to mark a center line on a piece of wood or metal, place the gage over it and bring



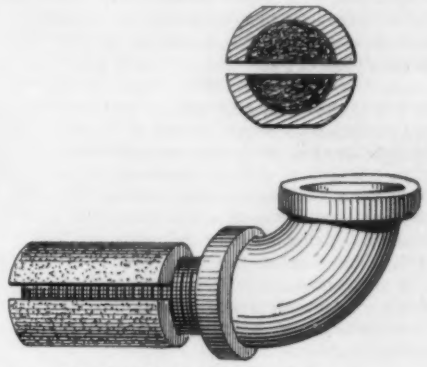
A center-line gage.

the sides of the end screws so they will press against the sides of the object to be centered. Then by pressing on the gage and running it up and down the desired line is secured. I have found this little tool much more convenient and accurate than the regular scratch gage for centering.

Unscrewing Nipples from Pipe Fittings

By G. H. Ander

WHILE doing some pipe fitting the other day, the writer needed some close nipples and was obliged to take apart and use old ones, stuck in tees and elbows, because there were no others to be had just



Device for unscrewing nipples.

then. It was impossible to get the old nipples loose with a wrench or in a vise without spoiling the thread, so a pipe-cap of the same size as the nipple was procured. This cap was cut in two with a hacksaw. The two halves were placed on the nipple, after first having filed them flat on the sides, in order to prevent them from turning around in the vise, while unscrewing the nipple. This method proved to be very successful. The nipples came out without any injury whatsoever.

Enlarging a Bore With an Auger

By F. H. Jackson

THE following kink should prove useful for plumbers or gas-fitters: When boring a hole through a joist for a pipe, the auger ran into a knot, throwing it a little out of line, so that the pipe when run through the hole would not screw into the fitting. The trouble was overcome by fitting a small circular piece of wood of same diameter as hole, on the spur of a larger auger which made a guide, and the hole was easily enlarged to a suitable size.

Enlarging a bore.

Shop Notes

Cuttlefish Paper.—Some years ago my attention was called by a professional friend, a dentist, to a paper which is sold by the dental supply houses under the name of "cuttlefish paper," and which is used by dentists to polish gold fillings, it being for this purpose cut into narrow strips, passed between the teeth, and pulled back and forth over the filling. The abrasive material on this paper (which comes in sheets about the size of ordinary sandpaper) is of such a degree of fineness, that it is difficult to tell which side of the paper is coated. The paper, which is apparently practically unknown except to dentists, has other very valuable applications. It is an ideal material for the rapid honing of razors and of surgical and other instruments requiring a fine edge. Its cutting qualities are so rapid that a pocket-knife blade of ordinary degree of sharpness can, by giving it fifteen or twenty diagonal strokes on a piece of the cuttlefish paper, laid flat, and followed by a slight stropping on a leather strop or shoe top, be brought, in the space of a couple of minutes, to such a degree of sharpness that it will remove the hair from the back of the hand or arm as though it were a razor in fine condition. In honing razors, especially those that have a rounded edge and need honing badly, it will produce results in one or two minutes that would require a half hour or more on a stone hone. For this purpose the paper is drawn over a level wooden block, and turned over the ends and tacked or clamped in place; the razor is then laid perfectly flat, and given diagonal strokes in both directions, drawing away from *the edge*. Ten to twenty strokes in each direction will usually be sufficient. A moderate amount of stropping will remove the slight feather edge sometimes produced, and leave the razor in fine condition for shaving. So far as I know, the paper is obtainable only through dental supply houses.—CLAUDE L. WOOLLEY.

Inventions New and Interesting

Simple Patent Law; Patent Office News; Notes on Trademarks

Automatic Control for Aeroplanes

AN aeroplane maintains a constant level in the air by maintaining a constant speed through the air. If the air is in motion, the matter is complicated by the fact that the winds never move with constant velocity. The steadiest of winds is interrupted now and then by a lull, and sometimes a wind is made up of a succession of puffs. An aeroplane when moving in a variable wind, particularly when moving in the direction of the wind, must bob up or down, depending on its velocity with respect to that of the wind. Under these conditions it finds the same difficulty of keeping its equilibrium that one experiences when trying to walk on a shaking platform, such as found in our amusement parks. Conditions would be the same were the machine flying in quiet air, while its engine was retarding and accelerating irregularly. The only cure for its staggering course in fickle winds is to compensate for the retarding and accelerating of the wind by accelerating and retarding the engine to a corresponding degree.

As a rule, aviators depend on hearing and touch to determine their speed through the air. But the best of pilots often find it difficult and impossible to account for variations of speed experienced during a flight. The balance of an aeroplane is so delicate that even in still air, it often swerves from unsuspected causes. Capt. Etévé of the French army states that more than four fifths of all aeroplane accidents are due to loss or excess of speed, and he believes that it is essential to good flying that the pilot of an aeroplane be provided with an instrument which will show the speed of his machine over the air. He devised a simple instrument of this sort, which is shown in Fig. 2.

It consists of an aluminium plate *A* with a dial sector on which is a prominent red reference mark shown at *B*. The indicator needle *C* is secured in a block pivoted at *D*. Rising vertically from this block is a rod, on the upper end of which is a hollow sphere *E;* a bob *F* below the block serves as a counterbalance, while a spring *G* may be adjusted to hold the sphere *E* in vertical position, and the pointer *C* on the mark *B* when the aeroplane is traveling at a certain pre-determined speed. As the instrument moves through the air in the direction of the arrow, the wind pressure on the sphere *E* causes the latter to swing on its axis *D*, and depress the pointer *C*, when the speed exceeds that for which the instrument has been adjusted. On the other hand, if the speed decreases, the spring *G* causes the pointer to rise above the mark *B*. This instrument is very sensitive and provides the pilot of the aeroplane with an accurate gage of his speed.

The extreme sensitiveness of the apparatus has given the hint to Capt. W. I. Chambers of the United States Navy to employ a speed indicator of this general character for the automatic control of the elevating rudder of the aeroplane. Capt. Chambers' instrument is shown in Fig. 1, which is partly broken away to show interior details. Like Capt. Etévé's speed indicator, it is provided with a dial sector *B*, and a pointer *C*, connected to a sphere *E*, which projects in the path of the wind. At each side of the safety mark *B* are arms *J* bearing contact buttons with which the pointer *C* is adapted to come into contact when the speed of the aeroplane exceeds or falls below the safety limit. The electric circuit is thus closed to elevate or depress the horizontal rudder of the aeroplane. The arms may quickly be adjusted by the pilot while in flight to suit any condition.

Mounted on the rod which bears the sphere *E* is the crosshead, from which are suspended upon a pair of very flexible spring bands *I*, weights *K*, that are adjustable on stems. The spring *G* pulls the rod on which the sphere is mounted and its tension is regulated by means of the screw *L*. A variety of adjustments are thus provided; first, the sphere *E;* second, the spring *G;* third, the crosshead *H;* fourth, the springs *I;* and fifth, the weights *K*. Thus ample flexibility is assured for the power and the sensitiveness of the pressure sphere and for the power and the sensitiveness of the accelerating action of the weights *K*, which operate above the axis *D*.

In a separate compartment of the instrument there is an electric lamp *M*, in front of which is a slotted cylinder *N*, which may be turned so as to allow the light to pass through the slot and illuminate the dial sector. This illumination may be made as bright or as dim as desired by rotating the cylinder. Above the instrument a 2-inch barometer *O* may be mounted, receiving its light through a slit as indicated at *P*,

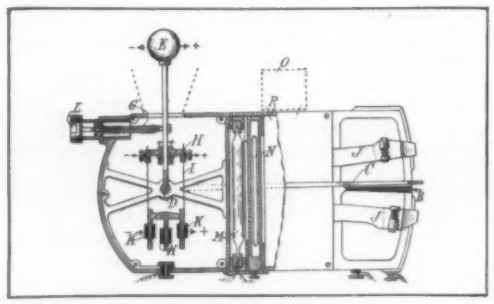


Fig. 1.—Combined speed indicator and automatic stabilizer.

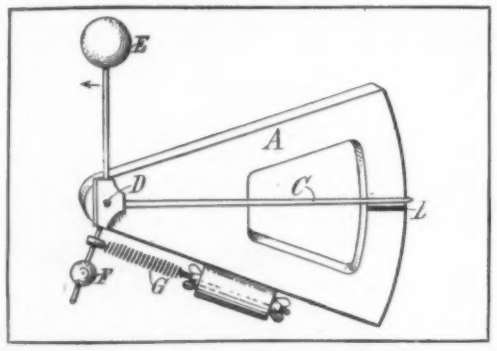
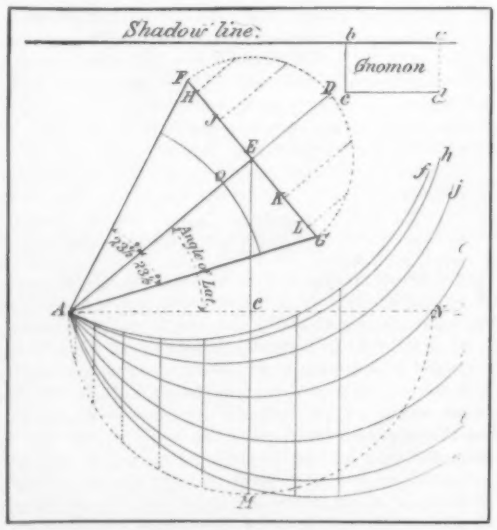
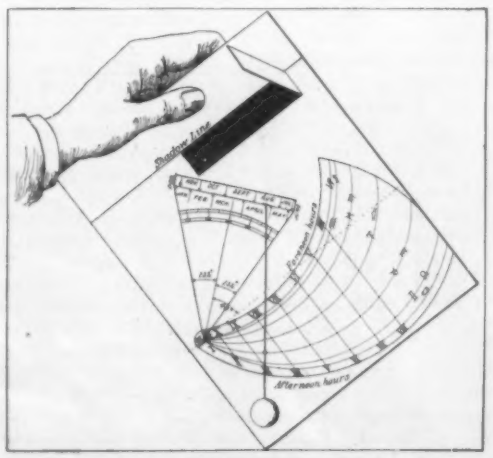


Fig. 2.—Speed indicator for aeroplanes.

the light being reflected to the barometer dial from a small semi-circular reflector above its face. Thus we have, combined with a flexible automatic stabilizing device of light weight, an effective speed indicator, which is always adjustable to suit the conditions of flight and is always available for use in event of motor derangement.



Construction of the dial face.



Method of using the pocket sun-dial.

A Pocket Sun-dial

By Dr. Leonard Keene Hirshberg

A NOVEL form of sun-dial has recently been devised by Mr. F. N. Lovegrove of London, England. Not only does this dial give the hour, but by it may be found the time of sunrise and sunset in any part of the country, also the sun's declination and the date of its entry into any constellation of the Zodiac. The sun-dial consists of a sheet of cardboard in the upper end of which a piece is cut out, so that it may be bent up to form a gnomon. When the shadow cast by the gnomon falls on a shadow line drawn on the cardboard, the time is determined by the position of a bead on a plummet line. The plummet line is adjustable in a slot to allow for variations in the declination of the sun at different dates throughout the year. The dial may be laid out as follows:

Draw first a shadow line near the upper edge of the cardboard, and near the middle of the cardboard draw the line *AB* parallel to the shadow line. Draw a line at right angles to *AB*, intersecting it at *C*. Extend this line to intersect the line *AD* at the point *E*, the line *AD* forming an angle with the line *AB* equal to the latitude in which the sun-dial is to be used. For instance, in New York, which is at latitude 40 degrees, the line *AD* would form an angle of 40 degrees with the line *AB*. Through the point *E* draw the line *FG* at right angles to *AB*, and the lines *AF* and *AG* forming angles of 23½ degrees with the line *AD*. With *E* as the center, describe the semi-circle *FDG*. Divide the arc into six equal parts and drop perpendiculars to the line *FG*. From the point *F* as the center with a radius equal to *AF*, draw the arc *Af*, and from the point *H* as the center with a radius equal to *HA*, draw the arc *Ah* and so on. Upon these arcs are drawn the hour lines, which are obtained in the following way: From *C* as a center with a radius equal to *AC*, draw the semi-circle *AMN;* divide this curve along the circumference into twelve equal parts, and from the points of division thus found, drop perpendiculars to the line *AB*. The hour lines may then be numbered as shown in the drawing. Mark the line *Af* with the zodiacal sign of Capricornus, and the line *Ah* with the signs of Aquarius and Sagittarius, the line *Aj* with the signs of Pisces and Scorpio, and so on with the rest of the arcs. The zodiacal signs may be found in any almanac.

The date line may now be laid out. An arc is drawn at *O*. This is calibrated in degrees of a circle. Then referring to an almanac for the declination of the sun at different times of the year, the line *FG* may be graduated to show the various positions of the sun for different months. For instance, the sun's declination on the first of August is 18 degrees north, and on the last of August is 8 degrees and 41 minutes north. By extending lines from *A* through the corresponding degrees in the arc *O*, the points where they intersect the line *FG* will mark the month of August on the date line. This space may then be sub-divided into thirty-one parts if desired to indicate the different days of the month. After the date line has been laid out, a slit is cut in the cardboard along the line *FG*. The gnomon is also laid out along the shadow line. The lines *ab*, *bc*, and *cd* are cut through, leaving the line *ad* uncut. On this line as a hinge, the tab of paper is bent up. A thread is now passed through the slit *FG*, and upon it a bead is fitted. A knot on the thread keeps it from slipping through the slit. The lower end of the thread is weighted with a small piece of metal. The sun-dial may then be used as follows:

If the observation is to be made on July 15th, the thread is moved in the slit to the corresponding position on the date line, and then is stretched across the 12 o'clock point and the bead is moved up to cover this point. Then the dial is held in the sun so that the shadow cast by the gnomon falls along the shadow line. The bead will swing down along the arc *Al*, and will come to rest over the hour of the day at which the observation is taken. When the plummet line hangs parallel to the line *CM* the bead will denote the hours of sunset and sunrise for that particular day. By stretching the plummet line across the point *A*, the declination of the sun for that particular date may be determined on the arc *O*. As in all sun-dials, allowance must be made for Greenwich time. The difference of longitude must be allowed for at the rate of four minutes for every degree, subtracting from sun-dial time to the east and adding to it the west. For instance, when it is five o'clock on the seventy-fifth meridian, from which time in the eastern section of

the United States is taken, the sun-dial will give the hour as four minutes past five in New York, which is on the seventy-fourth meridian.

The Trade-mark as a Business Asset

By W. E. Woodward

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[*THE average business man has only the vaguest notion of the value of a trade-mark. He does not realize that it is very often the connecting link between the producer and the ultimate consumer; that it is a symbol of good will, a tangible asset with a determinable money value; that it must be chosen and applied not in a haphazard way but with a due regard for its psychological effect upon the public. Nor does he realize the importance of complying with the statutory requirements which secure to him a property right in a trade-mark comparable with the property right that an inventor acquires by taking out a patent.*

The following is the fifth of a series of articles, written by a man who is at once a trade-mark, an advertising, and a business expert, a man who has a first hand knowledge of the value of trade-marks and of the correct methods of trade-mark exploitation. The series, which will be eventually published in book form, will include discussions, written in business English, of the Federal trade-mark law, analyses of the requirements for registration, the elements of a good trade-mark, and trade-mark protection.—EDITOR.]

Analysis of the Requirements for Registration.—V.

(*Continued from page 102, August 3d, 1912.*)

Many applicants for trade-mark registration seem to think that the mere misspelling of a descriptive word, or some fanciful device in lettering, will remove the word from the descriptive class. This is a belief that has no basis in fact; for no matter how a word is spelled or lettered, it is descriptive if it conveys information of a descriptive character.

For instance, the word "Bestok" was rejected as a misspelling of "Best Stock;" "Unxld" as a misspelling of "Unexcelled;" "Kid Nee Kure" as a misspelling of "Kidney Cure;" and "Pittsburgh Pump," printed with hyphens between the letters —P-I-T-T-S-B-U-R-G-H P-U-M-P—was refused registration as being both descriptive and geographical.

The courts have held that the word "Elastic," used to designate drawers having an elastic seam, is descriptive, but the same word is used in a fanciful sense and is valid as a trade-mark when applied to sectional bookcases.

A manufacturer of hooks and eyes applied for registration of the phrase "Rust? Never!" as a trade-mark. Registration was refused, as the mark was held to be descriptive, indicating that the hooks and eyes would never rust.

Arbitrary numbers are obviously registrable as trade-marks, but the applicant must be prepared to establish his contention that the numbers are really arbitrary and meaningless. In certain trades, numbers are used to designate grades of a product common to the trade, and, in that case, the grade numbers are descriptive by common usage. A plow manufacturer applied for registration of the symbols "A No. 1," "No. 1" and "AX No. 1" as trade-marks for plows. It was shown, upon examination, that these symbols are used by many plow makers to designate grades, and they were, therefore, ordinary descriptive trade terms. Registration was refused.

The prohibition against trade-marks descriptive of the character or quality of the product applies with equal force to trade-marks descriptive of the container or package. A flour manufacturer put up his product in barrels of a distinctive character—white and dark staves alternating. He applied for registration of a mark consisting of a pictorial representation of the striped barrel. This mark was considered descriptive, and registration was refused.

A Philadelphia candy manufacturer applied for registration of the word "Fussy," as used in the phrase "A fussy package for fastidious folk." The Patent Office held that the word "Fussy," as used in the phrase, was merely a descriptive term —an adjective qualifying "package"—and registration was accordingly refused.

The word "Spearmint," being a descriptive word, was refused registration as a trade-mark for Wrigley's Spearmint chewing gum, but the representation of a spear was considered registrable.

Various applicants have sought registration for trade-marks which, while they are meaningless to English-speaking people, are really descriptive terms taken from foreign languages. Such words are not registrable, for the Patent Office makes no distinction between languages. The phrase "Lait de Violettes," meaning the French "Milk of Violets," was rejected as a mark for perfumery. "Elegancia," the Spanish equivalent of the English word "Elegant," was rejected as a mark for perfumery. A descriptive word in a language as little known as Esperanto is, nevertheless, unregistrable. "Saniga" means "Sanitary" in Esperanto, and it has been accordingly refused registration on the ground of being a descriptive term.

In considering the question of descriptive marks, the difference between description and suggestion should not be overlooked. Suggestiveness is a highly desirable quality in a trade-mark, and many excellent and legally valid marks are suggestive. The name "Hydegrade," a registered trade-mark, applied to a well-known fabric, is suggestive of high quality, but it is not descriptive. It is a coined word, composed of the elements "Hyde" (name of owner) and "Grade." Another example of an excellent suggestive mark is "Rubdry" applied to towels.

Pictorial marks are often highly suggestive without being descriptive. The Baker Chocolate girl, depicted in the act of serving a cup of cocoa, suggests daintiness, taste, beverage, quickness in serving, and refreshment.

The word "Ideal," used in connection with a fountain pen, is considered fanciful, and not descriptive. It would seem that a very fine distinction is made here, as this word is an ordinary descriptive word, commonly used to express a state of perfection, as in the expression "An ideal day." It may be said, on the other hand, that nothing ever reaches an ideal condition, and, in that sense, the mark may be considered fanciful.

Geographical names, like descriptive terms, are the common property of all who use the language. No one manufacturer can appropriate such a term for his own exclusive use as a trade-mark unless he uses it in an arbitrary or fanciful sense. The only exceptions to this principle are to be found in the case of manufacturers who have adopted geographical terms as their trade-marks and have used them so long, without opposition or protest, that they have acquired a common law right to their exclusive use.

Among the geographical marks rejected by the Patent Office are the following:

"Yale," applied to hosiery; "Cloverdale," for canned fruits and vegetables; "Red River Special," as a mark for agricultural implements; and "Aurora" on shoes—the name "Aurora" being applied to localities in at least twenty States of the Union.

It would seem in the light of commonsense, that in the last-named case (that of "Aurora") the ruling of the Patent Office is on a very narrow basis indeed. The word "Aurora" has no geographical significance to the average person. It calls up a mental image of the dawn. If this case, and some others like it, are considered valid precedents, every applicant for trade-mark registration must be prepared to submit his application to the stern criticism of the Post Office Directory, with its catalogue of fifty thousand or more names. (It is interesting to observe that, in a later case, the Patent Office allowed the registration of "Aurora" as a trade-mark for oils, lard, syrup and honey.—Aspegren & Co., *ex parte*, 100 *Official Gazette*, 684.)

"Tabasco" was refused registration as a mark for a sauce on the ground that it is a geographical term, Tabasco being the name of a State in Mexico. "French" was rejected as a trade-mark for paint. On the other hand, "Celtic" has been registered as a trade-mark for tea. The word "Celtic" has reference to a race, of which the Irish are only one branch. It is not applied to any particular country or section of the globe.

The map of the United States has been refused registration as a trade-mark for sugar. "American Lady" was refused registration on the ground that the word "American" is geographical. When a geographical term, applied to merchandise, is used in a fanciful or arbitrary sense—that is, when it conveys no deception in regard to the origin of the merchandise—it may be registered as a valid trade-mark.

"Dublin" is a valid trade-mark for soap, although the soap is made in America. In the case concerning this mark it was shown that it is the practice of soap manufacturers to call their products "Limerick," "Scotch," "Irish," etc., and that the buying public is aware of the fanciful use of these names and is not deceived thereby.

"Vienna," applied to bread, is considered valid. No one expects bread made in Vienna to be sold in America, consequently no one is deceived by this fanciful use of the word.

"Gibraltar" is registered as a trade-mark for belting. It is true that Gibraltar is a geographical name, but its suggestiveness in regard to belting conveys the mental picture of strength, rather than the idea of origin.

The student of trade-mark conditions, having learned how rigorously the Patent Office interprets the section of the law applying to the registration of geographical terms, will perhaps be puzzled by the number of trade-marks of this class which seem to be valid and well-established.

The explanation of that is that many geographical names, which could not have been protected *ab origine* as trade-marks, have acquired a secondary meaning by long and exclusive use by a particular manufacturer. Such marks fall within the protection of the common law.

Some of these common-law marks are registered under the ten years' clause. Among well-known geographical trade-marks may be mentioned "Bristol" applied to fishing-rods; "Kalamazoo" applied to stoves; "Manhattan," the name of a brand of shirts; and "Elgin," "Waltham" and "Illinois," the names of watches.

(*To be continued.*)

Notes for Inventors

A Coat and Suspended Trousers.—Patent No. 1,031,719 to G. A. Kurz of Zanesville and H. C. Shonting of Columbus, O., discloses a coat with trouser legs supported from within the coat, and straps which are detachably secured to the upper ends of the trousers legs.

Preserving Oil Paintings by Nitrogen Gas.—In patent No. 1,031,727 Karl Mussbeck of Munich, Germany, has a means for preserving oil paintings, provides a casing for the painting having a glass plate to inclose the painting which casing is air-tight and supplies a charge of nitrogen gas within the casing.

An Abrasive Bowl that Pares Vegetables.—This vegetable peeler patented to Henry Robinson of South Orange, N. J., No. 1,031,735, includes a bowl-like receptacle which is rotated upon a vertical axis and has its inner side walls provided with an abrading surface which when revolved or moved in contact with the vegetable operates to remove the skin therefrom.

Storing and Launching Lifeboats.—A number of lifeboats are nested one in the other and carried from the ends of swinging davits by independent hoisting ropes and blocks so the lifeboat can be launched successively from the same davits from which they are suspended. The patent, No. 1,033,480, was issued to Henry A. Seymour of Washington, D. C.

A Novel Pneumatic Tire.—James P. Clare of Stratham, New Hampshire, has secured a patent, No. 1,033,229, for an inflatable tire which comprehends two separate tubes combined to form the tire. The two separate tubes are united to form a tire body and are so arranged and united that each separate tube will form a separate compartment, and portions of the combined tubes will form a third compartment.

Making the Kettle Shut Off the Heat.—Knud Valdemar Rotzov of Malmo, Sweden, has patented, No. 1,031,874, a device for controlling the heat by the steam from the liquid being boiled. In doing this he provides a cooking apparatus with a heating producing medium in the form of gas and a valve for regulating the supply of gas. The heat causes liquid to boil and the steam from the liquid being boiled by its condensation, operates upon the regulator for controlling the supply of gas.

A Novel Core for Elastic Tires.—William Barbour of Glasgow, Scotland, makes an elastic or resilient body as a filler for cushion tires and the like which comprises an inner member or body formed from the depilated hides of animals in a moist condition and an outer member inclosing said inner member and of waterproof material so it will conserve the moisture of the inner member, the depilated hides being wound under tension. Patent No. 1,031,671 has been issued to Mr. Barbour for the invention.

A Bill to Authorize the War Department to Test Upon Ships a Device for Hoisting and Lowering Lifeboats at Sea.—Mr. Peters has introduced in the House of Representatives a bill authorizing the Secretary of War to construct and test upon one or more army transports or other ships in the War Department, the device for hoisting and lowering lifeboats at sea, devised by A. S. Eells of Boston, Mass., and to meet the expenses out of any money in the treasury not otherwise appropriated.

A George Westinghouse Turbine.—In patent No. 1,031,757, George Westinghouse of Pittsburgh, shows a re-entrant turbine which has a bladed rotor element with a fluid discharging device which is movable toward and from the rotor and a stop on the turbine stator is arranged to limit the movement of the fluid discharge device toward the rotor. In the same issue Mr. Westinghouse patents, No. 1,031,759, a vehicle supporting device in which pneumatic cylinders are pivotally supported in connecting yokes and are interposed between the yokes and the axle of the vehicle forming stress transmitting devices.

Versatility of Women Inventors.—Women have not only patented cooking utensils and other household appliances, but many inventions along other lines have been made by them, as the records show that they have secured patents for cultivator attachments, baling presses, dump wagons, vehicle brakes, barrel taps, window frame and sash, calendar clocks and electric clocks, watch makers calipers, numerous educational appliances, heating apparatus, gas making apparatus, electro medical appliances, horseshoes, motors and wind mills, plumbing devices, railway appliances, theatrical apparatus and in numerous other mechanical fields.

Legal Notes

Recent Adjudicated Patents.—Out of nine adjudicated patents reported in the *Patent Office Gazette* of July 9th, 1912, only one was held void. In the other eight cases, two patents were held valid and infringed and in five cases no infringement was found.

A Door in an Interference Proceeding.—In an interference case of Summers v. Clark involving priority of invention of a door arrangement for dump cars, in which the doors at the bottom of the car roll open laterally of the car to discharge the load, the Court of Appeals of the District of Columbia in reversing the decision of the Commissioner of Patents, and awarding judgment to Summers, said it was constrained to believe with the Examiner of Interferences and the Examiner in Chief that Clark is not an independent, original inventor of the subject-matter in question.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Electrical Devices.

TELEPHONE ATTACHMENT.—J. E. ROSS, care of General Delivery, Cleveland, Ohio. The object here is to provide an attachment having an ear tube with members connecting the ear tube with clamping members, which embrace the conical portion of a telephone receiver, to press the cushion member mounted on the ear tube against the head of the receiver, around the opening of the said head.

Of Interest to Farmers.

INCUBATOR.—C. J. DITTBRENNER, P. O. Box 176, Cornwall, N. Y. This incubator can be readily assembled and disassembled, and is arranged to insure a uniform heating of the eggs in the hatching compartment, to provide a proper circulation of air, to moisten the air, and to furnish a suitable running space or nursery for the hatched chicks.

COW STABLE.—J. A. MONTGOMERY, Walton, N. Y., deceased; Harriet I. Montgomery, W. H. Montgomery, and M. C. Montgomery, administrators. This invention provides a stable where the atmosphere infolding the head and breathed by the cow is maintained separated from the atmosphere infolding the body of the cows; provides a flexible neck confining partition to be placed to permit the animal assuming various positions standing or recumbent; provides sanitary and inspection means and suitable ventilation augmenting devices for the head confining section of the stable.

Of General Interest.

SAFE DOOR.—G. COOK, care of Dr. R. S. Elliott, Laona, Wis. The inventor provides means especially adapted for safes having circular doors, for receiving explosives introduced between the door and the safe, and through the openings of the lock and bolt operating means, and conducting the explosives away from the door, there to be exploded, or otherwise disposed of.

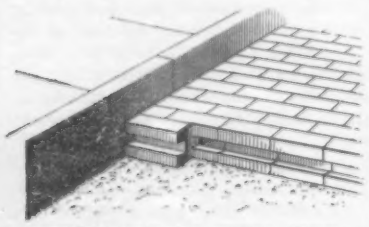
OILING ATTACHMENT FOR STREET SPRINKLERS.—R. E. CARLTON and S. Y. CULLEY, Latonia Station, Covington, Ky. This invention is an improvement in the application of oil to the surfaces of streets or roadways, which is desirable as is well known for the laying of dust as well as for the hardening of the road. By the improvement oil is supplied at the same time the surface is sprinkled with water.

BENCH.—H. A. WHEELER and C. W. WHEELER, Eddyville, Neb. The principal object of the invention is to provide a convertible bench adapted to a variety of uses, particularly the needs of osteopathy and chiropractics, the construction and arrangement being such that the parts are movable relatively one to the other, whereby the outfit is capable of manifold application.

BAG HOLDER.—L. A. DYKEMAN, Maryland, Otsego Co., N. Y. This improved form of bag holder is especially adapted for use on counters. An object of the invention is to provide a holder which is adapted to contain a number of pockets of varying sizes whereby bags of varying capacities may be held in convenient position for use.

RECEPTACLE.—W. J. HAMILTON, care of Park Hotel, Franklin, Pa. This invention relates to receptacles, and more particularly to barrels, and the purpose is to provide one with a plurality of side members having flanges which are engaged by sleeves for holding the side members together and against the heads which are disposed to croze in the side members.

BRICK PAVEMENT.—C. C. PETTIT, Greenford, Ohio. For the purpose of securing interlocking of adjacent rows of bricks to prevent displacement, shifting or sagging of a pavement at any one point over uneven or faulty foundation, use is made of interlocking rows of bricks, the bricks in successive rows breaking joint, and each brick being provided at one side with a tongue and the other with a

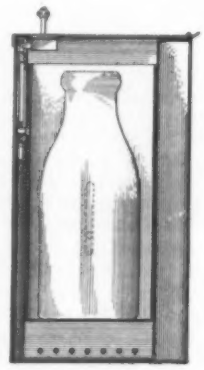


INTERLOCKING BRICK FOR PAVEMENTS.

groove, both extending from one end of the brick to the other end thereof, and the tongues of the bricks in one row fitting into grooves of adjacent joint-breaking bricks in the next row, so that each brick in each row is sustained. The engraving pictures a perspective view of the pavement.

FILM CAMERA.—H. W. HALES, Ridgewood, N. J. The main object here is to allow not only pictures of different sizes to be taken on the same roll of film at will, but to economize on the cost of operation by securing more exposures from the same roll or film, or if the usual number, then of a greater length than originally intended.

SAFETY RECEPTACLE.—W. WINKELMANN, 494 12th St., Brooklyn, N. Y. Bottles containing milk or other merchandise may be deposited in this receptacle, so as to prevent the latter from being tampered with by unscrupulous persons when the vender leaves

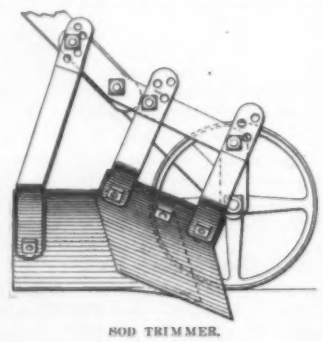


SAFETY RECEPTACLE.

them outside of the buildings. This simple inexpensive and perfectly secure device is normally maintained unlocked, but it may be automatically locked or placed in a receptive locking condition by the insertion therein of a full milk bottle or other merchandise. The accompanying illustration presents a vertical section of the receptacle showing it locked.

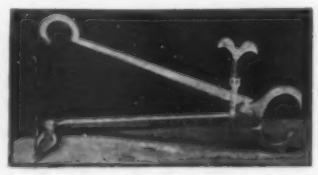
Hardware and Tools.

SOD TRIMMER.—N. NELSON, P. O. Box 15, La Fayette, Ore. Among the purposes of this invention is to provide an implement for use in landscape gardening and particularly trimming lawn borders along concrete walks or the like which will be more efficient and certain of operation than those usually employed, and that, too, with a minimum expenditure of power. The adjustment of the mold board is intended to accommodate operators of different heights, and this adjustment may be made independently of the adjustments of the cutter, the board being adapted to swing on the pivot according to such adjustments. The engraving gives a clear exposition of the trimmer in operative position.



SOD TRIMMER.

HOSE COUPLING AND CLAMP APPLYING IMPLEMENT.—WM. TANKERSLEY, La Junta, Colo. This patent, No. 994,664, consists of certain novel features which meets with enthusiastic reception by water, air and steam users, as it is adapted to the various



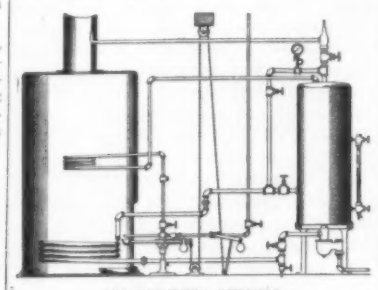
HOSE COUPLING AND CLAMP APPLYING IMPLEMENT.

sizes of fittings and makes of clamps, which are provided with two rings for various means. A spud for holding the fittings with an adjustable pin in gripping terminal, a slidable frame provided with a thumb screw for a clamping device, make it applicable to any place.

Heating and Lighting.

BURNER.—J. O. BROOKBANK, Driftwood, Pa. This invention provides a burner for burning kerosene, coal oil, petroleum, gasoline or other liquid fuel, and is arranged to permit of conveniently and quickly starting the burner, to prevent overflow of the liquid fuel in the burner and to prevent the escape of obnoxious fumes or odors into the room where the burner is located.

OIL BURNING SYSTEM.—F. J. KAESER, 420 Peavine St., Reno, Nevada. For the purpose of this invention, use is made of a boiler connected with a source of water supply, and with the steam generator arranged in the shell of a heating apparatus separate from the boiler, a superheater in the said shell above



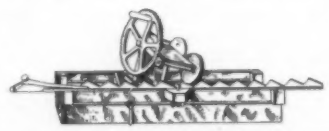
OIL BURNING SYSTEM.

the said steam generator and connected with the steam compartment of the boiler and with the burner proper located in the shell adjacent the steam generator, the burner proper being connected with a source of oil supply. The illustration herewith represents a side elevation of the system, parts being shown in section.

STOVEPIPE RETAINER.—W. H. PLEASANTS, Green River, Utah. This improvement provides a retainer to hold in operative position a stovepipe section to prevent the same from shifting in the stovepipe hole in the flue; provides a means for preventing the loosening of the holding devices therefor; and provides anchorage means to support other and connecting sections of the pipe.

Machines and Mechanical Devices.

GRINDING MACHINE.—G. W. HOADLEY, Garden Grove, Iowa. The principal object of this invention is to provide a new and improved grinding machine made up of parts which are so arranged that the grinding wheel may be adjusted to different bevels and angles when it is desired to sharpen the sickle of a mowing machine, the construction and ar-



GRINDING MACHINE FOR MOWING MACHINES, ETC.

rangement of parts being such that the device may also be used for grinding chisels, axes, and the like. The device is also adapted to be held in such a position that it may be used as in the ordinary grinding wheel. The view pictures the device in use in grinding a mowing machine sickle.

MACHING FOR SPLITTING AND REMOVING STUMPS.—A. S. HUNTER, Sr., 222 3d St., N. W., Washington, D. C. Mr. Hunter's invention relates to devices for splitting and removing stumps and trees, especially pine stumps, from which turpentine is to be extracted. An object is to provide a device by means of which the roots of the stump may be cut, the stump sawed and split, and the stump extracted.

BUTTON GRINDING MACHINE.—W. HERZOG, 9 Prospect St., Garfield, N. J. This invention has for its particular object the forming of perfect buttons from "seconds" by means of a machine of simple construction containing relatively few parts, which is adapted to form buttons of different shapes and sizes.

PUMP.—G. G. MCNEE, Box 442, Helper, Utah. The inventor provides a pump more especially designed for irrigation and similar work, and provided with one, two, or more pairs of cylinders to permit of pumping a large amount of water in a comparatively short time, and without requiring much motive power for actuating the pump.

EXCAVATOR.—N. A. LYBECK, 1 Madison Ave., Room 6060, New York, N. Y. The employment of this invention is particularly designed for the construction of canals and for the maintenance of waterways, by permitting the same from being filled or impeded by sedimentary deposit or débris. An incidental purpose is to economize in the cost of the operation of constructing the canal and of maintaining the clearway of the stream.

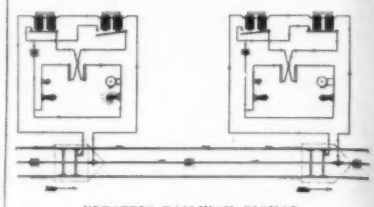
Prime Movers and Their Accessories.

GASOLENE FILTER.—F. CATCHPOLE, Pagosa Springs, Colo. The device is intended more particularly for use in connection with the gasolene inlet of carbureters of gas engines. The inventors provide a water chamber below the gasolene chamber for receiving any water in the gasolene, and a filtering dome is arranged around the inner end of the gasolene inlet pipe. Below the filter dome is an adjustable guard which regulates the communicating space between the gasolene and water chambers, and prevents splashing of the water on the filter. It is especially for use with automobiles.

Railways and Their Accessories.

SIGNAL INDICATING DEVICE FOR RAILWAYS.—E. DEBRIE, 12 Rue des Capucines, Paris, France. This invention has for its object a signal indicating device for railways, and has more particularly in view to secure the transmission of the track-signals to the engine-driver, while providing a safety-device which causes the automatic stopping of the railway trains.

ELECTRIC RAILWAY SIGNAL.—R. P. KISTLER, P. O. Box 653, Ponca, Okla. This invention refers to improvements in railway signals, and a particular feature of it is shown in a diagrammatic view of the arrangement of the signaling circuit when two trains are proceeding in the same direction. An object



ELECTRIC RAILWAY SIGNAL.

is to provide a device by means of which two engines which are approaching each other may be warned by means of signals to indicate such approach, when these engines are approaching head on, or when both are going in the same direction. Further, to provide means for indicating whether an engine is approaching from ahead or from the rear.

RAILWAY SWITCH.—A. COULOMBLE, 91 Bullard St., New Bedford, Mass. In the present patent the invention relates to railway switches, and the object is the provision of a switch having a rock shaft extending longitudinally of the main tracks, with two arms

RAILWAY SWITCH.

secured to the rock shaft, one of the arms having means for operating the switch rail, and the other arm having means by which it is adapted to be operated by an adjustable member on a car. The accompanying illustration pictures the invention in a plan view.

Pertaining to Vehicles.

VEHICLE WHEEL.—V. SANPHY, Box 123, South Bend, Wash. This invention relates to an improvement in wheels, and particularly to resilient wheels, and has for an object the construction and arrangement of improved means which will present a wheel structure adapted to resiliently give when the wheel is in use.

WIND SHIELD FOR AUTOMOBILES.—W. A. PEARSON, Troy, Ohio. This inventor provides a shield having hinge members, which are held yieldingly relatively to each other by springs, so that the members of the wind shield may be disposed in a plurality of positions relatively to each other, and be supported relatively to the hinge members.

AUTOMOBILE DRIVING GEAR.—J. HETTRICH, P. O. Box 664, Lincoln, Neb. The purpose here is to provide a direct driving connection between the motor and the wheels, so connected that there will be no interference with the steering mechanism, and wherein the differential connection of the wheels is independent of the axles.

VEHICLE WHEEL.—J. W. CALTA, Platte, S. D. An object here is to provide a device to take the place of a wheel provided with a pneumatic tire. This device has all of the advantages of the pneumatic tire, but is not as costly as the latter. Further, the object is to provide a wheel having a combined spring and pneumatic action, which results in a wheel having admirable riding qualities.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

WE wish to call attention to the fact that we are in a position to render competent services in every branch of patent or trade-mark work. Our staff is composed of mechanical, electrical and chemical experts, thoroughly trained to prepare and prosecute all patent applications, irrespective of the complex nature of the subject matter involved, or of the specialized, technical, or scientific knowledge required therefor.

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Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12669) R. T. asks: Could you name a substance that would stop completely the attractive action of a magnet? A. There is no material known which can stop completely the attractive action of a magnet. Magnetism passes through everything with considerable ease. Through iron and steel it passes with much greater ease than through the air and other common things. For this reason you can surround a magnet with a heavy casing of soft iron, and the magnetic lines will go around the magnet in the iron instead of leaving the iron and passing through the air inside the shield. This is the nearest to a magnetic shield that can be had.

(12670) A. H. W. says: Which is the better non-conductor of heat, fine wool or a space of equal area and depth filled only with air? If an attempt is made to use a chamber of air as a non-conductor, would it be necessary to make the chamber entirely "air tight?"—that is, altogether proof against egress and ingress of outside air. If an air chamber is used as a non-conductor, is it necessary that the incloscd air be below the temperature of the outside air? A. Heat always flows from bodies of higher temperature to adjacent bodies of lower temperature. "Non-conducting" materials are properly only slow-conducting, since all substances transmit heat in some degree. Dry gases, such as air, are very bad conductors; but if free to circulate in a hollow wall, the molecules of the air carry the heat rapidly by "convection" as they move about the space. For good effect, as heat insulation, air must be confined in cellular spaces, the smaller the better. All effective insulators, as wool or cork, depend for their action on the fact that they entrap large quantities of air in small spaces, so that it cannot circulate readily and transfer heat through the thickness of the insulating wall. It is, therefore, evident that the air should be confined closely, and that it will always be warmer than the cold side of the wall and colder than the warm side.

(12671) E. L. writes: Your favor of July 1st is very disappointing; it brings me up against a stone wall and does not tell me why I cannot climb over it. "An electric motor cannot charge a storage battery." Why not? If you can tell me of any publication that will answer that question, I will take it as a great favor. Funk & Wagnall's Encyclopedia: "Shunt machines are the most suitable for charging storage batteries; . . . the same machine which converts mechanical into electrical energy will serve the opposite function equally well. So I thought, by using one or more switches, the battery might be connected to the electromagnet or switched off to the armature as it was wanted to charge the batteries or to be run as a motor. A. The reason why an electric motor cannot charge a storage battery is that a motor is not a generator of an electric current. It receives electric current from some other source and transforms it into mechanical energy. A motor is often, as you know, capable of being used as a dynamo by applying steam or other power to it to turn the armature. It is then a dynamo and not a motor. All motors cannot be used in this way. Whether your motor can be, may be easily determined by an inspection by an electric engineer, say the engineer of the lighting station in your city. If feasible, you may then provide a gas or other engine for it, or even a small dynamo, which may be driven by your motor and be so wound as to furnish just the current required by your battery. Then, too, there are ways of cutting down the current to the capacity of your battery, and connecting it directly to the line which runs the motor. This mode is likely to be more expensive than to buy a small dynamo and run it with your motor. The statement you quote, "The same machine which converts mechanical into electrical energy will serve the opposite function equally well," is not always true. Many motors cannot be used as dynamos without alterations. No motor can be made a dynamo by simply the turn of a switch. A motor can be made a dynamo only by driving it with external power. A dynamo always transforms mechanical into electrical energy. You will find a much more correct statement of the interchangeability of dynamos and motors in Sloane's "Handy Book of Electricity," which we send for $3.50, as follows: "Electric motors had been constructed for many years before it was definitely decided that the same machine could receive electric energy and convert it into mechanical energy, thus constituting itself a motor, or could be operated by a steam engine, water turbine, or other prime motor, receive mechanical energy, and convert it into electric energy. It then is a generator or dynamo." (Page 218.) We hope this statement of your case is plainer than our first. We simply gave the answer without explanation in the haste of a crowded day, but are pleased to amplify it.

NEW BOOKS, ETC.

AN UNSINKABLE "TITANIC"; EVERY SHIP ITS OWN LIFEBOAT. By J. Bernard Walker, Editor of the SCIENTIFIC AMERICAN. New York: Dodd, Mead & Co., 1912. Size, 5¼ x 7¾; 185 pp.; 40 illustrations. Price, $1 net.

The object of this work is to show that during the past fifty years of progress the shipbuilder has been so much occupied in developing the speed and luxury of ocean travel that he has neglected to make the ocean liner reasonably safe. The most startling feature of the loss of the "Titanic" was the fact that she went to the bottom so soon after the collision. Both the owners and the public at large believed that the great ship was practically unsinkable; yet in the brief space of two and a half hours after striking, the "Titanic" sank in 2,000 fathoms. The most important lesson of the disaster is not the need for more lifeboat provision or for more careful navigation, though both are necessary. Reforms should begin with the ship itself, which should be so constructed that in the event even of such a serious collision as that of April 14th, a ship will serve as its own lifeboat, and remain afloat until the rescuing vessels, summoned by wireless, can come to its aid and transfer the passengers.

That such ships can be built is clearly proved by the fact that the first large ocean liner, the "Great Eastern," built over half a century ago, was so carefully safeguarded against sinking that, after running over a submerged rock off Montauk Point, and receiving far more serious damage to her hull than the "Titanic," she came safely to New York under her own steam. It is the object of this work to show that since her day there has been a steady decline in the art of unsinkable construction, and the book is a plea for a return to the principles of subdivision that were embodied in that fine vessel. This is the first time that a book has been written upon this vital subject of the safe construction of ships; and the argument for a reform in present methods and a return to the safe constructions of an earlier day is irresistible. The most vital chapter is one entitled "Safety Lies in Subdivision," in which, by means of diagrams, the various protective devices, such as bulkheads, watertight decks, and double skins, are clearly explained. The chapter on the "Great Eastern" contains a full description of that epoch-making vessel, with drawings and photographs showing her construction, and her appearance as she lay at the foot of Canal Street, New York. It is significant that the changes in ship construction suggested by the author are identical with those proposed, both by the Senate Investigating Committee and by Lord Mersey of the Board of Trade Investigation. In every chapter of the book will be found answers to the hundred-and-one questions which have been asked about this stupendous tragedy; and the author makes it perfectly plain just why this noble ship was lost, and how the recurrence of such a disaster may be rendered impossible.

The half-tones and drawings are admirably executed, the book is ably written, and the interest is sustained throughout. Readers of the SCIENTIFIC AMERICAN need no introductory to the author and to his clear and interesting mode of expression. Mr. Walker is an acknowledge authority on marine and naval matters, and yet his treatment of technical subjects is such as to appeal to laymen as well as engineers. As an excellent example of his readable and entertaining style, we need but point to the series of articles on target practice, which appeared in the SCIENTIFIC AMERICAN last fall, under the title of "The Log of a Landsman Aboard the Battleship North Dakota."

THE ART OF THE BERLIN GALLERIES. By David C. Preyer, A. M. Boston: L. C. Page & Co., 1912. Large 12mo.; 324 pp.; illustrated with full-page plates in duogravure. Price, $2 net.

Mr. Preyer's new volume concerns itself chiefly with the collection of the Kaiser Friedrich Museum, with a much briefer description of the nineteenth century paintings of the Royal National Gallery. The method followed in regard to the Kaiser Friedrich has been to give the Italian, Spanish, French, English, German, and Dutch-Flemish schools each a section of critical description, illustrated by fair reproductions of the more noteworthy canvases. The museum, while boasting comparatively few masterpieces by famous names, possesses such a broad, comprehensive stretch of work typical of schools and periods that its lessons are of the highest educational value. The Royal National Gallery, founded upon the 262 canvases bequeathed King Wilhelm by G. H. W. Wagener, has grown to 1,100 paintings, 233 sculptures, and 30,000 drawings and water colors, mostly by German artists. Among the mentionable plates of this section are the pleasing "Springtime in Ehringsdorf" by Karl Buchholz, the "Spring Day" of Böcklin, and the portrait of Mommsen by Franz von Lenbach.

THE GASOLINE AUTOMOBILE. Its Design and Construction. Vol. I. The Gasoline Motor. By P. M. Heldt. New York: The Horseless Age Company, 1911. 8vo.; 506 pp.; illustrated. Price, $4.

Mr. Heldt, prepared and fortified by eleven years' experience as editor of *The Horseless Age*, has given us an impressive work on automobile engineering. The first volume covers with much thoroughness all the elements, parts, and principles of the gasoline motor—the media through which it works, the laws of gases, the cycles, the conversion of reciprocating into rotary motion, the balancing of engines, and the oiling and cooling systems. Each important part of the motor is treated in a separate chapter, with profuse diagrams and succinct description. Motor testing, with the necessary indicators and apparatus, is also given a full and well-written explanation, and the resultant diagrams are shown, demonstrating out-of-phase crank motion, pre-ignition, late ignition, and slow combustion of ignited charge. In addition to photographic views of five modern motor equipments, a pocket in the back cover contains a book of valuable plates showing sectional diagrams of twenty standard makes of automobile engine. Mr. Heidt's volume is perhaps as well entitled to the adjective "exhaustive" as any other American work on the subject.

CHILE AND HER PEOPLE OF TO-DAY. An Account of the Customs, Characteristics, Amusements, History, and Advancement of the Chileans, and the Development and Resources of Their Country. By Nevin O. Winter. Boston: L. C. Page & Co., 1912. 8vo.; 411 pp.; illustrated. Price, $3.

Chile, the foremost maritime country of South America, well repays a thoughtful study and forces some optimistic prophecies of a greater future. With an extensive seacoast indented by splendid harbors, with mild climate, broad, fertile valleys, fine grazing grounds, and vast mineral wealth, it is physically favored beyond its sister nations. The strain of Araucanian blood gives to the national character a free, proud independence and a soldierly efficiency that must eventually combine with the natural resources to place Chile in a commanding position both on land and sea. By map, illustration, and sympathetic yet keen-visioned description, Mr. Winter places before us a vivid conception of Chile and her people, their activities, customs, aspirations, and present achievements. Among the appendices are some suggestions for travelers that, although brief, will conduce to the comfort and convenience of intending visitors.

GOD AND DEMOCRACY. By Frank Crane. Chicago: Forbes & Co., 1912. 16mo.; 72 pp. Price, 50 cents.

Whatever else they may lack one may always find in Mr. Crane's little preachments the vitality of optimism. He himself defines the scope and the limitations of "God and Democracy" when he says it is not a book of exhaustive argument, but of pointed suggestion. The dissertation seeks to show, in a reverent manner, how the idea of Democracy is altering our idea of God. The modern conception of God is less that of the Universal Ruler, and more that of the Universal Servant. Service is exalted above rule, and service, the writer believes, is for the first time in history acquiring a proper appreciation. "The greatest thing in the world is to serve."

THE CORONA COOK BOOK. A Collection of Choice Recipes with an Expansible Device for Keeping Personal Cooking Rules. By Ruth Alden. Chicago: The Abbey Company, 1911. Price, $1.25.

Strictly speaking, this is not a book at all, but a little box cunningly made to imitate a book, and containing recipes on separate cards, the subjects being self-indexing after the approved modern card-index system. Extra cards are provided, on which new or favorite recipes may be copied or pasted. Altogether it is a most convenient way in which to keep the recipes most frequently referred to, as any card may be taken from the box for ready use, and returned after its directions have been followed. The dishes furnished with the outfit are economical and nutritious combinations of plain and wholesome ingredients.

CRIMINAL PSYCHOLOGY. A Manual for Judges, Practitioners, and Students. By Hans Gross, J. U. D. With illustrations. Boston: Little, Brown & Co., 1911. 8vo.; 514 pp.

Hans Gross is probably the foremost criminal psychologist in Germany. He has had the practical experience of a criminal lawyer and a criminal judge in writing a book which is a marvel of erudition. The volume before us is a remarkable effort to produce what may be called a pyschological system which can be practically applied by criminal judges and lawyers. The deposition of witnesses, perception, superstition, probability, illusions, lying, mistakes, and isolated influences—all of these are considered from a criminological standpoint. Crimes are of such complex nature as to demand the systematic diagnosis of the criminal. Heredity and environment, associations and standards, initiative and suggestive ability all play their part. The judge or the lawyer who knows nothing of psychology, and only his criminal law, must flounder about hopelessly when confronted with the complex issues in which these factors play their part. Who but a psychologist can distinguish between hallucination and lying; between a superstitious believer in the reality of an experience and one suffering from an actual hallucination? Whatever may be the opinion of lawyers and scientific men as to the value of scientific aid in administering judgment, Prof. Gross firmly believes in the value of criminal psychology. This work may be accepted as the most authoritative book of its kind. Indeed, it was the first really objective criminal psychology which dealt with the mental states of judges, experts, jury, witness, and criminals.

PRACTICAL CEMENT WORK. An Elementary Treatise on Cement Construction. By W. B. Henry. Atlanta, Ga.: The Concrete Age Publishing Company, 1911. 16mo.; 110 pp. Price, 50 cents.

"Practical Cement Work" is a little treatise which those newly interested in any form of this construction will welcome. It gives the simple, fundamental principles of form building, waterproofing, coloring, and testing, tells how houses are built by this method, recites the processes of water and steam curing, and concludes with directions for making sidewalks, and floors for cellars, basements, and stables.

ASTRONOMY FOR ALL. By Bruno H. Bürgel. Translated from the German by Stella Bloch. London, New York, Toronto, and Melbourne: Cassell & Co., Ltd., 1911. Illustrated. 346 pp.

The author of this book, Bruno H. Bürgel, is a self-taught writer on astronomy and a pupil of the self-taught popular scientific writer, M. W. Meyer. Like his master, Bürgel has performed a useful work in emphasizing the more fascinating side of astronomy, and thereby awakening an interest in a science which cannot have too many devotees. His career is interesting. An eclipse of the moon, which occurred when he was thirteen years of age, aroused in him an undying interest in astronomy. His parents, however, were not in a position to gratify his desire for a university education. He was apprenticed to a cobbler and later to a printer, "where," he states, "I hope to get a chance to read much in order to educate myself." His first chance to study astronomy practically came when he received an insignificant post on the staff of *Urania*. Turning now to Bürgel's book, we find it written in a simple, sometimes even in a poetic vein. The chapter on Mars accepts the Lowell theory of the Martian canals, and even quotes with approval the statements of Flammarion and Klein, that Mars is inhabited. In the chapter of the sun, we find a little misinformation that ought to have been corrected. The sun motor in Pasadena, California, proved far less economical than the author states, and is now dismantled, we believe. Nothing is said of Hale's wonderful work with the spectro-heliograph. On the whole, for a good, popularly written book, this "astronomy" can be commended.

THE HELICOPTER FLYING-MACHINE. An Account of Previous Experiments, Including an Analysis of the Author's Turbine Machine, with Theory and Deductions. By J. Robertson Porter. London: "Aeronautics," 1911. 12mo.; 80 pp.; illustrated.

The ordinary types of direct-lift flying machines are characterized as efficient in weight lifting, but very unstable, and the main reason for this instability is charged to the fact that while one blade of the screw is advancing against a current of air, the opposite blade is at the same time traveling with the current, the resultant reaction of the blades thus failing to balance each other. To overcome this defect the author advocates the utilization of the turbine principle, in which the air set in motion by the rotating blades is directed downward by fixed deflecting surfaces, the pressure against the top fixed surfaces accomplishing the lift. Much of the work is merely speculative, and the experiments are shop tests made under not the best of conditions, but the determination of efficient curves, and some of the other formulæ and suggestions, should prove useful to experimenters in, and designers of, helicopter machines.

MODERN AMERICAN TELEPHONY. Edited by Arthur Bessy Smith. Chicago: Frederick J. Drake & Co., 1911. 12mo.; 790 pp.; illustrated. Price, $2.

The purpose of the manual is to help all whose duties call them into relationship with the theory, science, and art of telephony. After some preliminary explanation of the theories of sound and of induction, and of the application of principles in the transmission of spoken words, the reader is made familiar with the various circuits and systems, the battery equipments, magneto switchboards and switchboard installation, standard multiple switchboards, and testing apparatus. In the chapter on "Telephone Troubles and How to Find and Remedy Them," the difficulties most frequently encountered are cited, and all possible causes are given. Line and conduit construction, wireless telephony, and automatic switching are also made the subject of careful exposition.

STABILITY IN AVIATION. An Introduction to Dynamical Stability as Applied to the Motions of Aeroplanes. By G. H. Bryan. New York: The Macmillan Company. 192 pp. Price, $2.

Dr. Bryan attracted our attention by some striking contributions to *Nature* on the mathematical side of aeodynamics. The paper which he read before the British Association for the Advancement of Science aroused a very lively discussion, not all of which was favorable to Dr. Bryan. It is the general tendency to regard the flying machine as a shining example of an invention produced by practical men and not by scientists. There can be no doubt that the work done by the Wright brothers was far more scientific than most aviators are willing to acknowledge. At all events, even if the flying machine is the product of unmathematical reasoning, that is no reason why the aeronautical engineer of the future should not apply to his profession the same knowledge of mathematics which has come to be indispensable in other branches of engineering. It is the purpose of this volume to impart that knowledge so far as it affects problems of stability.

The Cream Separator

(Concluded from page 112.)

of Stockholm, Sweden, was one of the first inventors to confine himself to the development of the dairy separator. His inventions included mainly improvements in gearing, bearings, and shape of bowl. The company which worked his inventions early attained considerable success in the commercial field. It secured the ownership of the Houston and Thompson patent, and De Laval improved on it, and converted the raw idea into a practical machine. Ten years later, on the assignment to the company of the Bechtolsheim liner patents, the company secured an almost absolute monopoly in the manufacture of dairy separators.

Since the invention of the liner, progress has been steady and rapid. At first the makers were so flooded by orders from creameries that they could not turn their attention to the improvement of the separator for other than creamery purposes. The hand separator involved a number of problems not found in the power separator, but they were problems for the machine designer rather than for the inventor.

The hollow bowl separator is still in extensive use. For farm purposes, it possesses some striking advantages over the liner machine. Its ease of operation and its few parts, making cleaning easy, commend it to many people. The modern hollow bowl is a long slender tube with a skimmer at the top. The liner separator, however, despite its defects, has the field. It is exclusive in the creameries. Of the many farm separators on the American market, all but one are liner machines, and the majority of these belong to the disk type, described in detail in the original liner patent. This consists of a number of dished steel plates spaced apart and secured to rotate with the bowl. The milk is fed rapidly outward and is separated between the disks. The central core is a hollow slotted tube which serves both to convey the milk and to support the liner plates. Besides the disk, there are a dozen or more other types of liners, and these are susceptible of an infinite number of modifications, many of which are in actual use. Much serious study is being spent in working out the mechanical adjustment of the most efficient liner possible. Theoretical results are very difficult to demonstrate because even with perfectly transparent bowl and liner, it is difficult to determine the exact movement of the currents on account of their extreme rapidity of movement. Much of the work is being done by salaried experts in all of the larger factories, which have the equipment and funds necessary for carrying on the work.

The three problems of most importance are the problem of properly feeding the milk into the bowl, the regulation of the skimmer, and the cleaning problem. With or without the liner, the milk forms a hollow column in the rotating bowl. The richest cream is at the inner wall of the column, and the richness decreases toward the outer wall. Somewhere between center and circumference is the best point for applying the full milk. The direction of movement of the full milk on entering the bowl will manifestly have an effect on the efficiency of the machine. The skimmer, too, is susceptible of improvement. Usually some form of hollow screw on an eccentric axis is used. By turning the screw the richness of the cream can be regulated. At present, however, there is no satisfactory way of making the adjustment while the machine is in motion. The cleaning problem, while seeming to be simple, is in fact difficult and important. The bowl slush left in the separator contains much cheesy matter. This is difficult to remove with cold water and impossible with hot water. In the presence of water, hot or cold, it acts much like eggs, and when the liner is a complicated one, the cleansing involves as much work as dish washing after a large meal. The slush is an excellent breeding place for undesirable germs, and unless the cleansing is thorough, the next charge of milk is liable to become badly tainted. This usually means a money loss to the farmer since creameries grade their cream and pay for it accordingly. So serious is this trouble that separator cream is seldom equal in flavor to hand skimmed cream. The solution of this problem would be worth a fortune.

When the farmer has six or more cows, and sells either cream or butter, the separator pays handsome dividends on the investment. The saving in cream alone over the older methods will do this. The whole milk can be separated immediately after being drawn, instead of waiting from twelve to twenty hours. The farm separator has also an advantage over the creamery separator. Instead of daily trips, it means one or two trips a week, or better still, the cream can be taken along when another errand takes the farmer to town. The skim milk, instead of being left at the creamery or coming back with possible contamination of disease germs from other herds, is fed to the stock while still warm, and in its best possible condition. The farm separator has come to stay because it is a money maker for the farmer, and properly handled, it should be an important factor in conserving the fertility of the soil.

One of the difficulties in the way of complete separation of milk is the affinity of the small particles of proteids and oil for one another. Prof. Babcock made use of the fact that the proteids can be digested and dissolved in sulphuric acid, thus leaving all particles of butter fat free in a medium for which the particles have little or no affinity. He designed a compact and portable centrifuge, and test tubes so graduated that the proper proportion of milk and sulphuric acid could be introduced. The percentage of butter fat is indicated on direct reading. The method, because it enables even the most unskilled worker to make reliable tests, has superseded the old cumbersome laboratory methods, and is now in almost universal use in all countries where dairying is carried on.

The Motor Contest at Winnipeg

(Concluded from page 113.)

economy test. This was taken advantage of by some competitors who held their engines to as low a power output in the two-hour test as was consistent with economy, and then, with the fuel penalty removed, ran at the highest possible horse-power in the half-hour test. There were no points given on output of power in comparison with piston displacement, hence in one or two cases engines which had made very creditable showings from the practical standpoint, failed to get proper recognition.

In the plowing tests a field of 240 acres had been secured 12 miles from Winnipeg, and intermittent, happy-go-lucky train service enabled the competitors and visitors to reach the spot. The furrows were three fourths of a mile long, and each engine made a total of six miles, regardless of the number of plows pulled. This consumed from two and a half to three hours of actual plowing for each engine in addition to stops and turns. The field was not as smooth and uniform as had been secured in previous contests, consequently the draft of plows varied considerably more than the actual differences in the plows would account for. On the whole, the draft was much heavier than in any previous contest, and it is interesting to compare the figures of close to 900 pounds per 14-inch plow, 3½ inches deep, with the ordinary figure of 400 to 500 pounds for the same plow twice as deep in Illinois and Iowa.

Recording dynamometers gave the average draft very accurately, and an observer accompanied each outfit to get accurate data on the time, stops, condition of engine, and any other points which had bearing on the performance of the outfit. Careful measurements were taken of the fuel and water consumed in relation to the horsepower developed and the acres plowed. The score card was so arranged as to encourage the development of as high a horsepower as possible, consistent with economy, but no maximum test on the drawbar was included. The drawbar horse-power developed, therefore, is probably nearer the economy load in most cases than the maximum. This was illustrated by the larger Rumely tractor, which was used again in the engine gang-plow competition. It developed only 34.4 tractive horse-power in the engine competition and 42 in the plow competition, pulling a larger number of plows then because there was no penalty for fuel consumption. Points were given for the number of acres plowed per hour in comparison with the horse-power developed in the economy brake test, and this was another element tending to keep the showing on the economy run down to as low a horse-power as would still give economical results.

Another factor which seemed hardly correct, was the scoring of the engines on the distance traveled, or acres plowed, without replenishing fuel and water. The scoring was done simply on the percentage of the tank capacity which was used, and did not consider that only in very few instances could any tractor exhaust its supply of water before running hot. In the case of a steam tractor a certain amount of water must be retained in order to keep the crown sheet covered, and in the case of practically every internal-combustion tractor, not more than 10 to 25 per cent of the total water capacity could be used without causing difficulty.

Following the engine competition was a rather elementary contest for engine gang plows. Instead of making short rounds which would require considerable turning, and give the plowman a real opportunity to show up his gang, only one round was plowed and that of the same length as in the engine competition. It was found afterward that a portion of the points in the score card would have to be omitted on this account. Five companies had entered plows, but only three competed. One withdrew early, and another at the last moment, after the decision to plow but one round had been announced. The Avery Company won in the above classes with their self-lift plow, the Rumely plow being second, and the gang made by the J. I. Case Plow Works (not identified with the J. I. Case Threshing Machine Company) third.

The competition drew the usual gallery of visitors of all classes, although the contest each year is becoming of greater interest to the technical men and less to the farmer. One of the latter exclaimed, when he saw the engines working on the plowing field, "Why, that's just the same as we do at home." To the engineer, however, these contests afford a great opportunity to uncover his own hand for the sake of seeing what progress is being made by his competitors. The competition brings the most prominent men of this stamp together, and at least once a year the progress of the industry is thoroughly reviewed. There is no question that indirectly the results have thus been of enormous value to the farmers of the world. There is a striking contrast between the easy certainty with which the tractors and plows now perform their tasks, and the scenes at the first few contests.

There is considerable agitation in favor of having a motor contest in the United States, but it is out of the question for the average manufacturer to spare his valuable men for more than one such occasion in each year. So long as Winnipeg, having the advantage, clings to her opportunity, just so long does it seem certain that once every year the eyes of the traction engine world will all be turned toward this magnificent city of the Northwest.

A Sahara Sea

(Concluded from page 114.)

of fertility except moisture; also that there exist plentiful underground streams and reservoirs. Now, if these crystal supplies were brought to the surface through hundreds of artesian wells and properly irrigated through the land, supplemented by artificial reservoirs to conserve the precious waters of the occasional rains, ample resources thus exist in the Sahara itself for bringing about future conditions of fertility such as have been

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achieved in formerly arid regions of the United States.

Many schemes for irrigating the Sahara have been discussed. The old project, first broached by the French engineer, Col. Roudaire, and indorsed as entirely feasible by De Lesseps and other competent authorities, has never been utterly cast aside. To let in the waters of the Mediterranean to flood the most sunken portions of the Algerian Sahara and thus "render fertile large tracts of otherwise barren sand" would not by any means change the whole desert into a vast inland sea, as so many people have imagined, nor in the least affect the climate of Europe, since only some 3,100 square miles of territory, in the form of two distinct lakes in central and southern Algeria, would be drenched.

Prof. Etchegoyen, however, wishes to construct a deeper and longer canal so as to flood a much more extensive tract of desert. But it should be remembered that, since by far the greater part of the Sahara is from seventy feet to more than a mile in elevation above ocean level, and those tracts which lie below ocean level are chiefly valleys between the hills and mountains or the basins of ancient lakes never very extended in area, a Sahara Sea would consist only of an exceedingly irregular body of water containing many islands and extending into the unflooded districts in a multitude of bays and coves. It would be considerably less than one third the size of the Mediterranean. The reported "one half" is somewhat exaggerated.

Now arise the various questions of what important effects such a sea would produce upon the earth. Without discussing further any political or economic influences, there is still much to consider with respect to its possible physical influences. At last, in the progress of human achievement, mankind fears the power of its own ingenuity.

The writer feels that this alarm can be happily allayed, so far as a Sahara Sea is concerned. We are warned that "by the displacement of so many billions of tons of water, the equilibrium of the earth would actually be affected." Let us figure it out. Suppose the Sahara Sea should have an entire area of 250,000 square miles (thus allowing generously for any doubtful regions of desert that might become flooded) and a mean depth of 200 feet. Since one square mile contains 27,878,400 square feet, this entire area would contain 6,969,600,000,000 square feet and 1,393,920,000,000,000 cubic feet. Division of this sum by 40 (the number of cubic feet displaced by one ton)—the result is 34,848,000,000,000 tons of water required to flood the Sahara as suggested. If the canal to admit this water were cut through the north coast of Africa, these thirty-five thousand billions of tons of water would flow in from the Mediterranean Sea, and at the same time the Atlantic waters would flow into the Mediterranean until a level was again established. If the canal were cut to the West African coast, water from the Atlantic would flow directly in, without visibly disturbing the Mediterranean. In either case, the process would be gradual; the flooding of the desert would not be a sudden, precipitous inundation.

Of course, 34,848,000,000,000 tons is a great deal of water. But compare its volume. In that little curve of the Atlantic Ocean which forms the coastline of the New England States and New Brunswick and part of Nova Scotia, there is an area just about equal to the product of 500 by 500, or 250,000 square miles—the same area allowed above for the Sahara Sea. There is a daily tidal rise in this locality varying from about ten feet along Cape Cod to sixty feet in some parts of the Bay of Fundy. Allowing a mean distribution of 20 feet rise, the number of tons of water thrown upon these shores twice every day is fully one tenth as many as would be required to form a Sahara Sea. No one ever fears that this tidal displacement of water will "unbalance" the earth, or in the language of science, disturb the obliquity of the ecliptic. Thirty-five thousand billion tons, in proportion to the bulk of the earth, is utterly infinitesimal. In proportion to the volume of the ocean it is as a drop out of a pailful. And it is proposed to spread out this slight burden of displaced weight over a region nearly at the equator. A little further reasoning, or experimenting with globes or balls, will show that, since the earth is not exactly spherical but is somewhat thickened at the equator and flattened at the poles, to disturb her present axis of 23½ degrees inclination it would be necessary to apply additional weight at either one of the two poles. Additional weight spread out at the equator could not affect the balance of the axis.

We are also warned that the climate of Europe would be endangered. That is a more interesting, because more plausible, objection. At present there is very little rain over the desert region of North Africa. Scientists agree that this dryness is due not to the arrangement of neighboring mountain ranges but to various physical causes in the region itself. Perhaps the presence of so extended a body of water might produce rains. Certainly it would equalize the temperature so that there would be less intense heat by day and less intense chill by night; but comparison with other regions bordering upon seas in the equatorial zone shows that it could not reduce the temperature of a tropical climate to that of any merely temperate region not influenced—as Bermuda is, for example—by warm winds or currents. That eliminates one of the assumed dangers. The warm climate of the British Isles is due to warm ocean currents which sweep their shores; it is most unlikely that drawing from the Atlantic Ocean the water required to form a Sahara Sea would deflect, to any serious degree, if at all, any of these great currents. That eliminates another danger. The third and last danger that has universal import consists in whether or not such a sea would too greatly cool the winds that blow from Africa across the Mediterranean to southern Europe. Paragraphs might be written in discussing this interesting point, in telling how the winds originate in this region, the direction and influence of the trade-winds, etc. But it is safe merely to predict that while colonists living upon the shores of the Sahara Sea would doubtless delight in any cool zephyrs that might blow from its surface around their homes, there would be no appreciable change in the "Afric breezes" that blow across the Mediterranean. Why, the Sahara Sea would be merely a big shallow pond, an unusually large irrigation reservoir, compared with the natural seas and great lakes of the world!

It should be remembered that if France reclaims the desert, she will do so for her own benefit. For several years Algeria has been to France what Florida is to New England during the winter months—her mainstay for all kinds of early vegetables. The green produce, leaving Algiers at noon, is unloaded at Marseilles in the afternoon of the next day, starts on the evening trains for Lyons and Paris, and within thirty-five to forty hours after leaving Africa is on sale in the Paris markets. It was this proximity that first attracted her attention to Africa. At the same time she is not likely to permit the carrying out of any scheme which could injure the climate of southern France and destroy the revenue of her noble vineyards.

The American Road Congress

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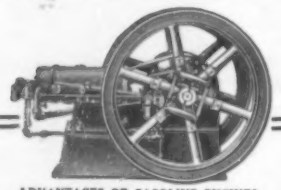

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Every type of road will receive thorough attention in the papers, and discussions beginning with the humble earth road and going through all the standard forms of construction, including the modern bituminous roads, brick roads, concrete roads, and all the forms of construction that are now in use.

Contractors who attend the congress will have an opportunity to see the exhibits of all manufacturers with whom they wish to do business, and to mingle with the public officials to whom they will look for contracts. They will hear some practical papers read by prominent contractors.

The Government exhibit, according to an announcement just made by Hon. Logan Waller Page, director of the United States Office of Public Roads and active president of the American Road Congress, will have a complete exhibit on the Million Dollar Pier, which will contain models of all the various types of roads.

The highway departments of all the States in the union will be represented at the Congress, and there will be a comparative analysis of the contract and force account system in road construction. Papers will also be read on the relation of the contractor to the public official.

The site chosen for the American Road Congress, which marks the consolidation of the convention interests of the American Association for Highway Improvement, with all its allied organizations; the American Automobile Association, with all its affiliated clubs and associations; and the National Association of Machinery and Material Manufacturers, will undoubtedly make a special appeal to the more than 100,000 officials employed throughout the country in supervising construction or maintenance of public highways. Many have written to the headquarters of the American Road Congress in the Colorado Building at Washington, to say that they intend to combine business with vacation by spending the week beginning September 30th at the sessions of the congress.

Automobile tours are being arranged by the American Automobile Association from all sections of the country, and many of the legislators and other officials of the various States intend to be present. The principal addresses will be made by President Taft and Gov. Woodrow Wilson of New Jersey.

Preserving Fresh Flowers

IN order to keep cut flowers from withering, the water which they lose by evaporation must be replaced. Hence the stems are placed in water, the absorption of which may be facilitated by cutting the end of the stem to a wedge shape and thus increasing the absorbent surface. The same effects are produced to a still greater degree by crushing with a hammer an inch or more of the stem.

After a time the wound becomes covered with products of decomposition, due to the presence of bacteria, which impede the absorption of water, especially if the air of the room is warm and the section is not sharply cut. It then becomes necessary to cut off the diseased part of the stem in order to lay bare the mouths of the capillary vessels.

According to *La Nature*, the life of cut flowers can be prolonged somewhat by substituting distilled water for river water. Hot water also gives good results, especially with fleshy plants like hyacinth and narcissus. When the flowers, kept in ordinary water, begin to fade, the bottom third of the stalk is immersed in very hot water. As the water cools the flowers resume their natural degree of stiffness. Before they are replaced in fresh water the portion which has been immersed in hot water should be cut off.

Various antiseptics are sometimes added to the water in which flowers are kept. The addition of a few pieces of wood charcoal retards putrefaction, but it is still necessary to change the water every five or six days.

Soap is employed as a preservative in the following manner: The flowers are first sprinkled lightly with fresh water

Interesting Books

The Scientific American Boy

By A. RUSSELL BOND, 12 mo., 317 pages, 340 illustrations. Price, $2.00.

¶ This is a fascinating story of outdoor boy life, and contains a large number of practical suggestions which, in addition to affording amusement, will stimulate in boys the creative spirit. In each instance complete practical instructions are given for building the various articles. The boy camper is supplied with directions for making tramping outfits, sleeping bags, tents, tree houses, straw huts, log cabins and caves. Winter diversions include instructions for making skate sails, snow shoes, ice boats, scooters, sledges, toboggans, etc. The more instructive subjects covered are surveying, wigwagging, heliographing and kite-building. Miscellaneous devices, such as scows, canoes, row yachts, windmills, water wheels and the like are also described. It is attractively illustrated with half tones from life and numerous diagrams and engravings drawn to scale.

The Scientific American Boy at School

By A. RUSSELL BOND, 12 mo., 336 pages, 314 illustrations. Price, $2.00.

¶ This is a sequel to "The Scientific American Boy" and like its predecessor is brim full of practical suggestions, all of which are entirely new. The construction of the apparatus, which is within the scope of the average boy, is fully described and the instructions are interwoven in a fascinating story, which makes the book interesting as well as instructive to the boy. The volume contains instructions on surveying, sounding and signalling, the building of dams, canals and canal locks, truss bridges and several different types of boats. Sun dials, clepsydra, seismographs, gliding machines, kite photography and camera hunting are a few of the other interesting subjects taken up. Other unique ideas are water kites, fish-tail boat-propelled bicycle sleds, geyser fountains, etc. No boy of a mechanical turn of mind can read the story without being inspired to try his hand at making the devices.

Magic, Stage Illusions and Scientific Diversions, Including Trick Photography

Compiled and Edited by ALBERT A. HOPKINS. Large octavo, 556 pages, 400 illustrations. Price, $2.50.

¶ This work appeals to old and young alike, and is acknowledged by the profession to be the standard works on magic. The illusions are all explained in detail, which show exactly how the tricks are performed. Great attention is paid to the exposes of large and important illusions, which in many cases have been furnished by the prestidigitateurs themselves. Some of the most important tricks of Robert Houden, Bautier de Kolta, Heller and Hermann are explained. Conjuring tricks have not been neglected, a selection of some of the best of them having been made—fire-eaters, sword-swallowers, ventriloquists, shadowgraphists—all come in for a share of attention, while mental magic, ancient magic, trick photography, automata, curious toys and stage effects are well described and illustrated.

The New Agriculture

By T. BYARD COLLINS, 12 mo., 374 pages, 166 illustrations. Price, $2.00

¶ This interesting volume is a popular outline of the many changes which are revolutionizing the methods of farming and the habits of farm life. It deals with the subject in a scientific way and form a new viewpoint. The author has devoted his lifetime to the study of changing economic agricultural conditions. Irrigation, the new fertilization, the new transportation, the new creations, the new machinery, all come in for a share of attention. The illustrations are of special value, and are unique. All who are interested in agriculture should obtain a copy of this most timely addition to the literature of agriculture.

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With an Introduction and Editorial Notes by PROF. HENRY P. MANNING. 12 mo., 251 pages, illustrated. Price, $1.50

¶ A friend of the Scientific American donated a prize of $500 for the best simply-worded non-mathematical explanation of the fourth dimension. The prize essay, together with the three others, which were accorded honorable mention, were published in the columns of the Scientific American. As a result, so much interest was aroused on the subject of the fourth dimension, that it seemed advisable to collect, in permanent form, the most meritorious of the 245 essays which were sent in from all parts of the world. The present work presents twenty points of view, all of them interesting and no two quite alike. The reading of one essay does not involve the reading of the entire work, yet the entire book gives a comprehensive view of what the layman wishes to know about the fourth dimension.

The American Steel Worker

By E. R. MARKHAM. 12 mo., 369 pages, 163 illustrations. Price, $2.50.

¶ This is a standard work by an acknowledged authority on selecting, annealing, hardening and tempering all grades of steel. The author has had twenty-five years' practical experience in steel working, during which time he has collected much of the material for this book. Careful instructions are given for every detail of every tool. Among the subjects treated are, the selection of steel to meet various requirements; how to tell steel when you see it; reasons for different steels; how to treat steel in the making of small tools, taps, reamers, drills, milling cutters; hardening and tempering dies; pack hardening; case hardening; annealing; heating apparatus; mixtures and baths, the best kind, and why; and in fact everything that a steel worker would want to know is contained in this book.

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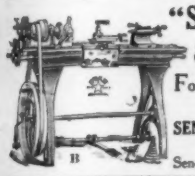

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and are then placed in a vessel containing soapy water. Every morning they are taken out and completely immersed in pure water for two minutes. They are then sprinkled again and their stems are replaced in the soapy water, which should be changed every three days. It is asserted that flowers can be kept at least a month in this way. In another method the washings are omitted but the soapy water is changed daily. The solution is prepared, in quantity, by dissolving one ounce of white soap and one tenth ounce of common salt in one quart of water, and adding a little pulverized borax.

Sugar is also recommended as a preservative. The best results are obtained by dissolving in each quart of water about five ounces of sugar for pinks, three ounces for roses and six ounces for chrysanthemums. Good results have been obtained also with sodium carbonate (washing soda) and with ammonium chloride (sal ammoniac). The last named salt, however, alters the delicate tints of some roses.

In general, flowers which are to be kept long in water should be gathered early in the morning and in the state of buds about to open, and the stems should be immersed for two thirds of their length. In order to retard evaporation, the room in which the flowers are kept should be heated and ventilated as little as possible.

Evaporation can be prevented by covering the petals with a varnish made by dissolving 20 parts by weight of light copal, previously mixed with an equal weight of fine sand or pulverized glass, in 500 parts of ether. The flowers are dipped in this solution four or five times at intervals of ten minutes in order to allow the ether to evaporate. Flowers treated in this manner retain their freshness and beauty for a long time.

Finally, the following method is generally recommended for preserving flowers, and roses in particular, for long periods. A tin box is partly filled with very fine and perfectly dry salt (dried over a fire if necessary). The buds are laid on the bed of salt so that they do not touch each other, and the box is filled with salt and hermetically closed. If the dried buds are taken from the salt at any time within several months, and their stems are cut and placed in water, they gradually resume their original freshness and open.

A glass-stoppered jar filled with alternate layers of violets and salt, and kept at a moderate temperature, may be employed to perfume a room at any time after two weeks, and retains its fragrance many months, if not opened too frequently.

The Current Supplement

THE SUPPLEMENT, No. 1910, brings a number of good articles this week. Prof. Diaz-Ossa, of the University of Chili, is peculiarly qualified to speak to us on the manufacture of Chili Saltpeter.—The description of a recently installed museum devoted to animal life underground will interest our biological readers.—Dr. Steinmetz, famous for his work in electricity, addresses us this time on a question relating to another field of physics, and makes some very interesting reflections on the second law of thermodynamics.—The center-page article is devoted to the remarkable operations in damming the Mississippi for power purposes.—Our metallurgical readers will be interested in an article on the relations of iron, vanadium and carbon in steels.—A description is given of the low temperature laboratory at Leyden, in which Prof. Kamerling Onnes carried on some of his famous work.

Increasing the Visibility of Vapor.—In a patent, No. 1,031,250, Thomas A. De Vilbiss of Toledo, O., presents a method of demonstrating perfumes or toilet waters in which he mixes with the perfume or toilet water an odorless liquid of greater consistency, specifically glycerine, than the perfume, so that the visibility of the vapor produced is enhanced and the moisture of the vapor is lessened, and then effects a nebulization of the mixture.

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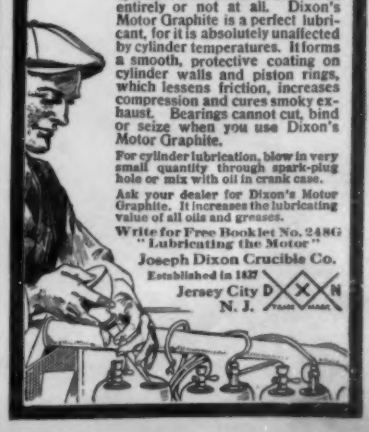

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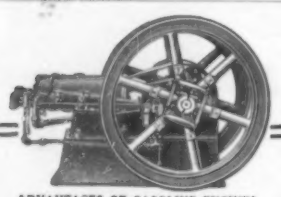

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Every type of road will receive thorough attention in the papers, and discussions beginning with the humble earth road and going through all the standard forms of construction, including the modern bituminous roads, brick roads, concrete roads, and all the forms of construction that are now in use.

Contractors who attend the congress will have an opportunity to see the exhibits of all manufacturers with whom they wish to do business, and to mingle with the public officials to whom they will look for contracts. They will hear some practical papers read by prominent contractors.

The Government exhibit, according to an announcement just made by Hon. Logan Waller Page, director of the United States Office of Public Roads and active president of the American Road Congress, will have a complete exhibit on the Million Dollar Pier, which will contain models of all the various types of roads.

The highway departments of all the States in the union will be represented at the Congress, and there will be a comparative analysis of the contract and force account system in road construction. Papers will also be read on the relation of the contractor to the public official.

The site chosen for the American Road Congress, which marks the consolidation of the convention interests of the American Association for Highway Improvement, with all its allied organizations; the American Automobile Association, with all its affiliated clubs and associations; and the National Association of Machinery and Material Manufacturers, will undoubtedly make a special appeal to the more than 100,000 officials employed throughout the country in supervising construction or maintenance of public highways. Many have written to the headquarters of the American Road Congress in the Colorado Building at Washington, to say that they intend to combine business with vacation by spending the week beginning September 30th at the sessions of the congress.

Automobile tours are being arranged by the American Automobile Association from all sections of the country, and many of the legislators and other officials of the various States intend to be present. The principal addresses will be made by President Taft and Gov. Woodrow Wilson of New Jersey.

Preserving Fresh Flowers

IN order to keep cut flowers from withering, the water which they lose by evaporation must be replaced. Hence the stems are placed in water, the absorption of which may be facilitated by cutting the end of the stem to a wedge shape and thus increasing the absorbent surface. The same effects are produced to a still greater degree by crushing with a hammer an inch or more of the stem.

After a time the wound becomes covered with products of decomposition, due to the presence of bacteria, which impede the absorption of water, especially if the air of the room is warm and the section is not sharply cut. It then becomes necessary to cut off the diseased part of the stem in order to lay bare the mouths of the capillary vessels.

According to *La Nature*, the life of cut flowers can be prolonged somewhat by substituting distilled water for river water. Hot water also gives good results, especially with fleshy plants like hyacinth and narcissus. When the flowers, kept in ordinary water, begin to fade, the bottom third of the stalk is immersed in very hot water. As the water cools the flowers resume their natural degree of stiffness. Before they are replaced in fresh water the portion which has been immersed in hot water should be cut off.

Various antiseptics are sometimes added to the water in which flowers are kept. The addition of a few pieces of wood charcoal retards putrefaction, but it is still necessary to change the water every five or six days.

Soap is employed as a preservative in the following manner: The flowers are first sprinkled lightly with fresh water

Interesting Books

The Scientific American Boy

By A. RUSSELL BOND, 12 mo., 317 pages, 340 illustrations. Price, $2.00.

¶ This is a fascinating story of outdoor boy life, and contains a large number of practical suggestions which, in addition to affording amusement, will stimulate in boys the creative spirit. In each instance complete practical instructions are given for building the various articles. The boy camper is supplied with directions for making tramping outfits, sleeping bags, tents, tree houses, straw huts, log cabins and caves. Winter diversions include instructions for making skate sails, snow shoes, ice boats, scooters, sledges, toboggans, etc. The more instructive subjects covered are surveying, wigwagging, heliographing and bridge building. Miscellaneous devices, such as scows, canoes, land yachts, windmills, water wheels and the like are also described. It is attractively illustrated with half tones from life and numerous diagrams and engravings drawn to scale.

The Scientific American Boy at School

By A. RUSSELL BOND, 12 mo., 338 pages, 314 illustrations. Price, $2.00.

¶ This is a sequel to "The Scientific American Boy" and like its predecessor is brim full of practical suggestions, all of which are entirely new. The construction of the apparatus, which is within the scope of the average boy, is fully described and the instructions are interwoven in a fascinating story, which makes the book interesting as well as instructive to the boy. The volume contains instructions on surveying, sounding and signalling, the building of dams, canals and canal locks, truss bridges and several different types of boats. Sun dials, clepsydra, seismographs, gliding machines, kite photography and camera hunting are a few of the other interesting subjects taken up. Other unique ideas are water kites, fish-tail boat-propeller, bicycle sleds, geyser fountains, etc. No boy of a mechanical turn of mind can read the story without being inspired to try his hand at making the devices.

Magic, Stage Illusions and Scientific Diversions, Including Trick Photography

Compiled and Edited by ALBERT A. HOPKINS. Large octavo, 556 pages, 400 illustrations. Price, $2.50.

¶ This work appeals to old and young alike, and is acknowledged by the profession to be the standard work on magic. The illusions are all explained in detail, which show exactly how the tricks are performed. Great attention is paid to the exposes of large and important illusions, which in many cases have been furnished by the prestidigitateurs themselves. Some of the most important tricks of Robert Houden, Bautier de Kolta, Heller and Herrmann are explained. Conjuring tricks have not been neglected, a selection of some of the best of them having been made—fire-eaters, sword-swallowers, ventriloquism, shadowgraphists—all come in for a share of attention, while mental magic, ancient magic, trick photography, automata, curious toys and stage effects are well described and illustrated.

The New Agriculture

By T. BYARD COLLINS, 12 mo., 374 pages, 106 illustrations. Price, $2.00

¶ This interesting volume is a popular outline of the many changes which are revolutionizing the methods of farming and the habits of farm life. It deals with the subject in a scientific way and form a new viewpoint. The author has devoted his lifetime to the study of changing economic agricultural conditions. Irrigation, the new fertilization, the new transportation, the new creations, the new machinery, all come in for a share of attention. The illustrations are of special value, and are unique. All who are interested in agriculture should obtain a copy of this most timely addition to the literature of agriculture.

The Fourth Dimension Simply Explained

With an Introduction and Editorial Notes by PROF. HENRY P. MANNING. 12 mo., 251 pages, illustrated. Price, $1.50

¶ A friend of the Scientific American donated a prize of $500 for the best simply-worded non-mathematical explanation of the fourth dimension. The prize essay, together with the three others, which were accorded honorable mention, were published in the columns of the Scientific American. As a result, so much interest was aroused on the subject of the fourth dimension, that it seemed advisable to collect, in permanent form, the most meritorious of the 245 essays which were sent in from all parts of the world. The present work presents twenty points of view, all of them interesting and no two quite alike. The reading of one essay does not involve the reading of the entire work, yet the entire book gives a comprehensive view of what the layman wishes to know about the fourth dimension.

The American Steel Worker

By E. R. MARKHAM. 12 mo., 369 pages, 163 illustrations. Price, $2.50.

¶ This is a standard work by an acknowledged authority on selecting, annealing, hardening and tempering all grades of steel. The author has had twenty-five years' practical experience in steel working, during which time he has collected much of the material for this book. Careful instructions are given for every detail of every tool. Among the subjects treated are, the selection of steel to meet various requirements; how to tell steel when you see it; reasons for different steels; how to treat steel in the making of small tools, taps, reamers, drills, milling cutters; hardening and tempering dies; pack hardening; case hardening; annealing; heating apparatus; mixtures and baths, the best kind, and why; and in fact everything that a steel worker would want to know is contained in this book.

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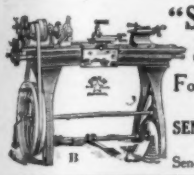

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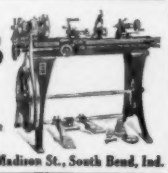
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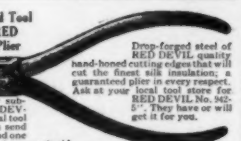
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and are then placed in a vessel containing soapy water. Every morning they are taken out and completely immersed in pure water for two minutes. They are then sprinkled again and their stems are replaced in the soapy water, which should be changed every three days. It is asserted that flowers can be kept at least a month in this way. In another method the washings are omitted but the soapy water is changed daily. The solution is prepared, in quantity, by dissolving one ounce of white soap and one tenth ounce of common salt in one quart of water, and adding a little pulverized borax.

Sugar is also recommended as a preservative. The best results are obtained by dissolving in each quart of water about five ounces of sugar for pinks, three ounces for roses and six ounces for chrysanthemums. Good results have been obtained also with sodium carbonate (washing soda) and with ammonium chloride (sal ammoniac). The last named salt, however, alters the delicate tints of some roses.

In general, flowers which are to be kept long in water should be gathered early in the morning and in the state of buds about to open, and the stems should be immersed for two thirds of their length. In order to retard evaporation, the room in which the flowers are kept should be heated and ventilated as little as possible.

Evaporation can be prevented by covering the petals with a varnish made by dissolving 20 parts by weight of light copal, previously mixed with an equal weight of fine sand or pulverized glass, in 500 parts of ether. The flowers are dipped in this solution four or five times at intervals of ten minutes in order to allow the ether to evaporate. Flowers treated in this manner retain their freshness and beauty for a long time.

Finally, the following method is generally recommended for preserving flowers, and roses in particular, for long periods. A tin box is partly filled with very fine and perfectly dry salt (dried over a fire if necessary). The buds are laid on the bed of salt so that they do not touch each other, and the box is filled with salt and hermetically closed. If the dried buds are taken from the salt at any time within several months, and their stems are cut and placed in water, they gradually resume their original freshness and open.

A glass-stoppered jar filled with alternate layers of violets and salt, and kept at a moderate temperature, may be employed to perfume a room at any time after two weeks, and retains its fragrance many months, if not opened too frequently.

The Current Supplement

THE SUPPLEMENT, No. 1910, brings a number of good articles this week. Prof. Diaz-Ossa, of the University of Chili, is peculiarly qualified to speak to us on the manufacture of Chili Saltpeter.—The description of a recently installed museum devoted to animal life underground will interest our biological readers.—Dr. Steinmetz, famous for his work in electricity, addresses us this time on a question relating to another field of physics, and makes some very interesting reflections on the second law of thermodynamics.—The center-page article is devoted to the remarkable operations in damming the Mississippi for power purposes.—Our metallurgical readers will be interested in an article on the relations of iron, vanadium and carbon in steels.—A description is given of the low temperature laboratory at Leyden, in which Prof. Kamerling Onnes carried on some of his famous work.

Increasing the Visibility of Vapor.—In a patent, No. 1,031,250, Thomas A. De Vilbiss of Toledo, O., presents a method of demonstrating perfumes or toilet waters in which he mixes with the perfume or toilet water an odorless liquid of greater consistency, specifically glycerine, than the perfume, so that the visibility of the vapor produced is enhanced and the moisture of the vapor is lessened, and then effects a nebulization of the mixture.

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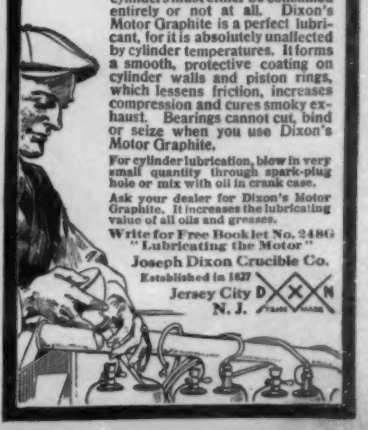
A perfect lubricant for gas engine cylinders must either be consumed entirely or not at all. Dixon's Motor Graphite is a perfect lubricant, for it is absolutely unaffected by cylinder temperatures. It forms a smooth, protective coating on cylinder walls and piston rings, which lessens friction, increases compression and cures smoky exhaust. Bearings cannot cut, bind or seize when you use Dixon's Motor Graphite.
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